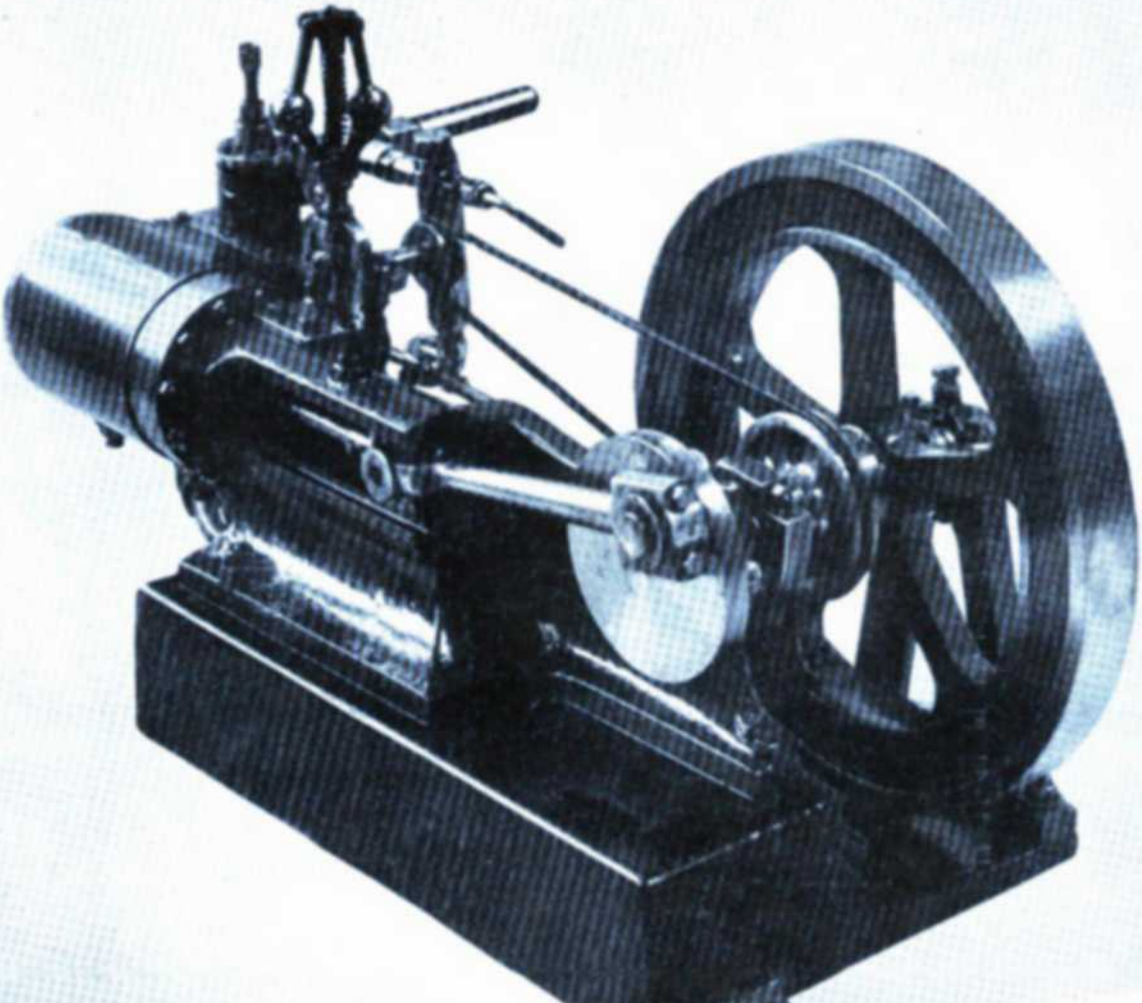
THE MODEL ENGINEER



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THE MODEL ENGINEER

EVERY THURSDAY

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Our Cover Picture

In the introduction to the series of articles on the Double Tangye type engine, published in the January 7th issue, reference was made to single-cylinder versions of the design, and in particular, to one such engine seen at the 1953 " M.E." Exhibition, in the S.M.E.E. collection of working models. This photograph shows the model in question; we have not been able to ascertain the name of the constructor, but we should be glad to hear from anyone who can give us further information about it, including the origin of the castings and drawings from which it was constructed. It is fairly certain, however, that quite a number of these models, both of the single and double type, have been built by readers of "The M.E.," as the design is a particularly attractive one, and quite straightforward to construct, also sufficiently powerful to be capable of really useful work if required.

SMOKE RINGS

Steam Wagon Reprieved

WE ARE indebted to Mr. W. Skinner of Coventry for sending us a cutting from a recent issue of the *Coventry Evening Telegraph* containing the interesting story of *Chugging Clara*, a Clayton steam lorry which is claimed to be the only steam lorry now working in the Midlands. Her owners had decided, some time ago, that *Clara* was to be taken off the roads at Christmas; but this decision caused such a protest from the company's employees, who have a genuine affection for the old lady, and from customers to whom she is something of a tradition of their supplies, that a reprieve has been granted.

Clara is an 8-ton lorry and her laden weight is so high that she costs £90 a year in road tax alone. Against this, however, is the fact that during 35 years of back-breaking labour, she has been " in for repairs " only once; and that was last year, when a new 8-cwt. crankshaft had to be specially cast and fitted. Her manufacturers went out of production more than 20 years ago. How long *Clara's* reprieve will last remains to be seen, but already a request for her has been received from a Dutch museum.

Steam Car Construction

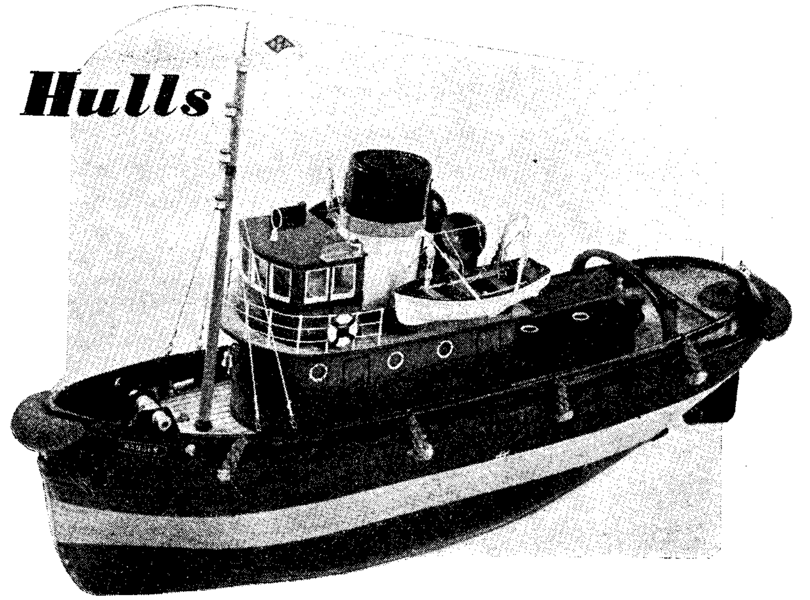
ON MANY occasions in the past the subject of the steam car has been discussed in letters and articles published in THE MODEL ENGINEER, and from the enthusiasm displayed in these it is clear that this form of transport holds a great fascination for many readers. Comparatively little practical activity in the construction of steam cars, or their experimental development, however, has come to light, and one very obvious reason for this is that the work involved, and the size of machine tool equipment required for machining the components, are beyond the scope of the average home workshop. In this connection, it is interesting to learn that the British Light Steam Power Society has introduced a design for a steam car engine in which machining problems are reduced to a minimum, most of the materials, with the exception of the cylinders, being in the form of stock bar and sections. At a recent meeting of the society, an uncompleted engine of this type, built by a member, was exhibited, and created considerable interest. All the parts, with the exception of the L.P. cylinder casting, were machined on a 5-in. lathe, and the fitting and assembly were also proportionately simple.

The society has also produced designs for other essential steam car components, including a monotube (flash) boiler and a direct-acting feed pump. Drawings are, we understand, available only to members at present, but it is hoped that when development work is completed, some further details will be issued for general publication. In the meanwhile, any readers who are interested in the development of small steam power units for transport, marine or stationary work should get in touch with the above society; the secretary is MR. T. F. DOYLE, " Summerfield," Weir Place, Chertsey, Surrey.

A Business Transfer

ONE OF the well-known model engineering businesses of recent years was that of A. J. Every. It was not a very big concern, but it catered for the somewhat less ordinary types of model engineering interest, by the supply of drawings, castings and materials for model traction engines, portable engines and certain stationary engines. After the death of Mr. Every, a year or two ago, the business was carried on by his wife and son; and now we learn that it has been taken over by our old friend Dick Simmonds of Erith. Readers who may be looking for castings and materials of the kind just mentioned are advised, therefore, to get in touch with Dick Simmonds. The Every specialities were interesting and unusual, and we are glad to know that their future production is safely in the hands of a fellow-enthusiast.

Laminated Hulls



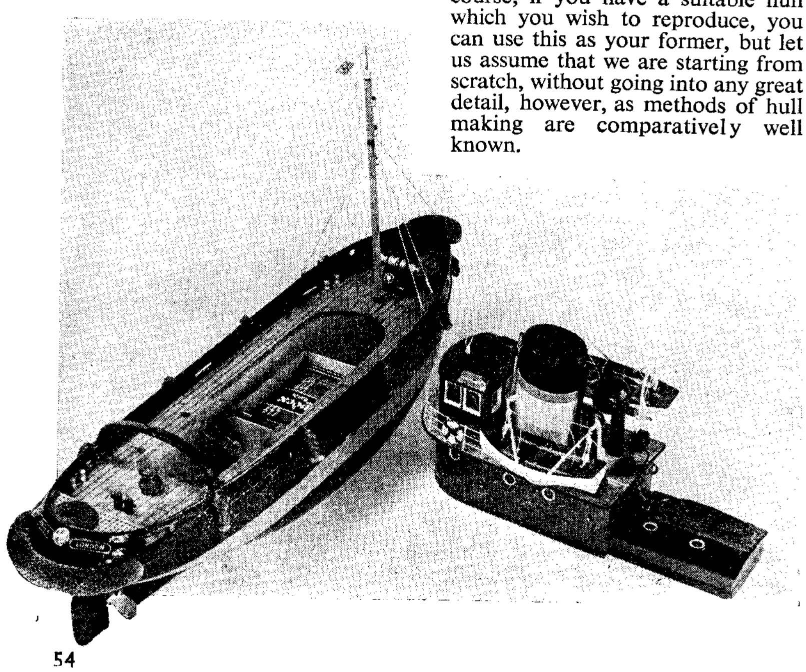
A SIMPLE METHOD OF CONSTRUCTING MODEL BOATS

By J. C. Hool

A NUMBER of people who were fortunate enough to visit the "M.E." Exhibition in August, may recall the exhibit presented by Chloride Batteries Limited (manufacturers of "Exide" and "Drydex" batteries) showing how to make boat hulls out of gummed sealing tape such as is used commercially for sealing up parcels. During the course of the exhibition, leaflets were handed out to interested people explaining the process, but from correspondence received since the exhibition, I am sure that readers of THE MODEL ENGINEER throughout the world who were not able to attend the exhibition may also find some useful applications for the process that was demonstrated.

Many years ago, I snicked the end of my thumb, and as a temporary "repair job," covered the cut in tissue paper, holding this in place with gummed sealing tape moulded to the shape of my thumb whilst the tape was wet. When dry, this made a very effective finger-stall, and provided the germ of the idea for moulding small model parts, particularly ships' lifeboats.

The method is ideal for repetition work, such as making lifeboats, ventilators, funnels, etc., but for the purpose of illustration, let us take as an example the making of a model tug boat. You first of all require a mould or former for the hull, and this of course should be carved of wood, either from the solid or, perhaps on a larger model, using the well known "bread-and butter" system. Alternatively, of course, if you have a suitable hull which you wish to reproduce, you can use this as your former, but let us assume that we are starting from scratch, without going into any great detail, however, as methods of hull making are comparatively well known.



Making the Hull Former

On a block of wood large enough to cover the overall dimensions of the finished model, mark out the plan, end and side elevation (Fig. 1A).

Next cut out the block of wood roughly to plan, end and side elevation, as in Fig. 1B. Now carve and sandpaper to finished lines, as at *C*.

After the hull former has been finished, it should be painted with a primer and finishing coat, to give a smooth and non-porous surface. Alternatively, the hull may be waxed, but personally I find that a painted surface is much easier to work on when it comes to the next stage, which is as follows:

Making Paper Hull on a Former

Working from amidships, cover part of the hull former with wet tissue paper so that it holds to the shape of the former temporarily, and thus prevents the first layer of tape from sticking to the mould; then lay over this wet tissue, strips of moistened gummed tape (about ½ in wide for a hull 2 ft. long), overlapping each other by approximately half the width of the tape (Fig. 2A). I have found that the best method of moistening these strips of tape is to draw them through a shallow dish of water, squeezing off the excess moisture by drawing the tape between the rim of the dish and a finger. A number of strips can be laid on one side, gummed side upwards, these being applied to the former in the order in which they were moistened. This gives the tape time to absorb moisture and takes out the initial stiffness. When the first section is completed, proceed in the same

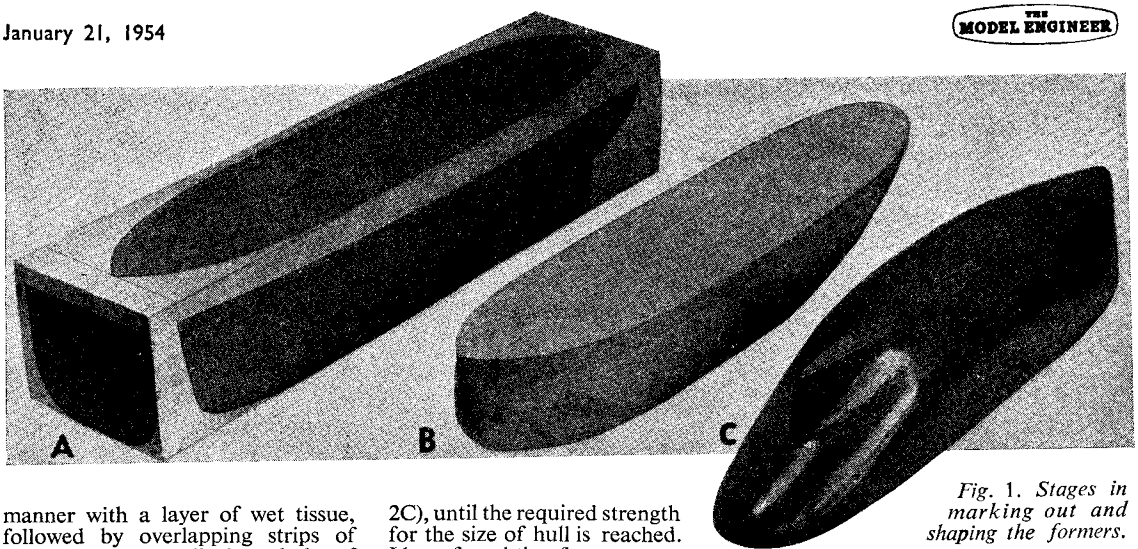


Fig. 1. Stages in marking out and shaping the formers.

manner with a layer of wet tissue, followed by overlapping strips of gummed tape, until the whole of the former is covered. At the bow and the stern you will find that the strips of tape will not lie parallel with one another, but do not worry about this, just carry on and ensure that the whole of the former is covered, first by tissue and then by tape.

After this initial layer of gummed tape is practically dry, trim off the edges of tape overhanging at the deck line and then carefully ease the hull shape off the former (Fig. 2B). If you find that the shape tends to stick to the former in places, the two can be fairly easily separated by easing a strip of celluloid between the former and the hull shape.

To guard against any subsequent tendency for the hull shape to stick to the former, dust the hull former with french chalk, and then replace the hull shape firmly on the former.

Build up overlapping layers of tape at varied angles for each layer (Fig. 2C), until the required strength for the size of hull is reached. I have found that four separate layers of tape strips are sufficient for a hull 18 in. long, and for a hull 3 ft. long, five layers are quite satisfactory. After having built these layers up to the strength required, the excess tape should again be trimmed off at the deck line.

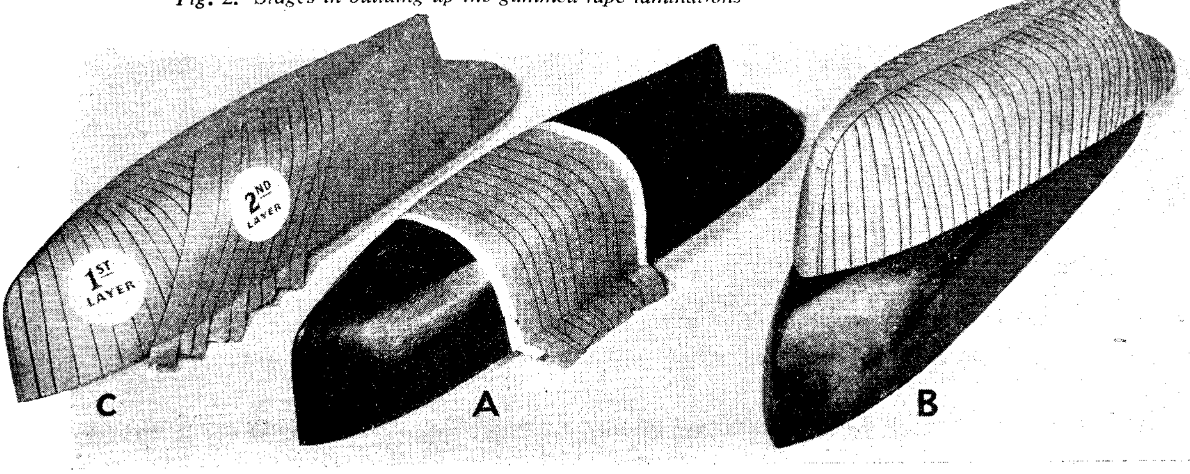
The final layer of tape should be more carefully laid, according to the type of hull being modelled. In the case of this particular hull, the "plates" (Fig. 3A) would be laid from the keelson upwards, in line with full-size practice, cutting each plate according to scale dimensions. In the case of a lifeboat hull, it would of course be necessary to lay the final layer of strips according to the type of planking required. For a clinker built hull, planks overlapping, as in Fig. 4A. For a carvel hull, planks edge to edge to give smooth exterior, as in Fig. 4B. For a diagonal hull, planks laid edge to edge, again giving a smooth exterior (Fig. 4C).

Before removing the finished hull shell from the former, you may wish to give additional stiffness by running a line (or lines) of tape right round the hull at the deck line edge. I have found that this stiffening on the deck line provides a very useful rubbing strake when the model is completed.

Completing the Hull

For this type of hull, it is necessary to have a wooden deck to stiffen the shell, and to make this, use the hull former as a template to mark out the deck plan on a suitable piece of wood, and then cut the wood to your plan. Mark out and cut away a hole in the deck to enable the power plant, stern tube and rudder post, etc., to be subsequently fitted. The deck should then be pinned and glued into position, and when the glue is hard, shape off that portion

Fig. 2. Stages in building up the gummed tape laminations



of the deck above the curve of the deck line (Fig. 4D).

The bulwarks for the hull shell you have made may be moulded in the same way as you have made the hull, by making a former to fit on the deck of the completed hull. In this case the bulwark former only is covered with tissue and the tape stuck thereon is overlapped on to the edge of the hull shape itself. The bulwarks are built up until the strength required is reached. After trimming off excess tape from the top edge of the bulwarks, the bulwark former may be removed and the bulwarks themselves capped with a narrow strip of tape folded in a "V" section.

In the case of a steamship hull I have found that the stern tube and rudder post tube may be held securely in position by plastic wood, built up around them inside the hull, but methods of securing will of course vary according to the type and power of propulsion plant being installed.

Hulls made by this method are not in themselves waterproof, but they can be made so by simply painting with either cellulose or oil paint. The inside of the hull is also similarly treated.

The same method may be used to make many deck fittings. For a funnel, use a tube of the diameter required and stick layers of gummed tape around (not forgetting the initial layer of wet tissue to prevent sticking). When dry and painted, this will form a very strong and waterproof tube. The cowl section of a ventilator may be moulded around the end of a chisel handle, and the ventilator trunking rolled round a suitable piece of dowell. In this case the two parts are afterwards glued together, and the ventilator cowl is then cut away to lead into the trunking.

Lifeboat hulls may be quickly made on a former. For a small lifeboat 2 in. long, it is only necessary to have two layers of tape, one across the former and the final layer laid on lengthwise as in the planks of a clinker built boat. Frames of paper and thwarts, etc., should be fitted after the hull is removed from the former.

Gratings may be made by several layers of strips of gummed tape, and though not according to full-size practice, the final result looks very well indeed on a model.

Having given you the bones of this idea, may I suggest that anyone who wishes to make a hull to scale size, appearance, and possibly weight,

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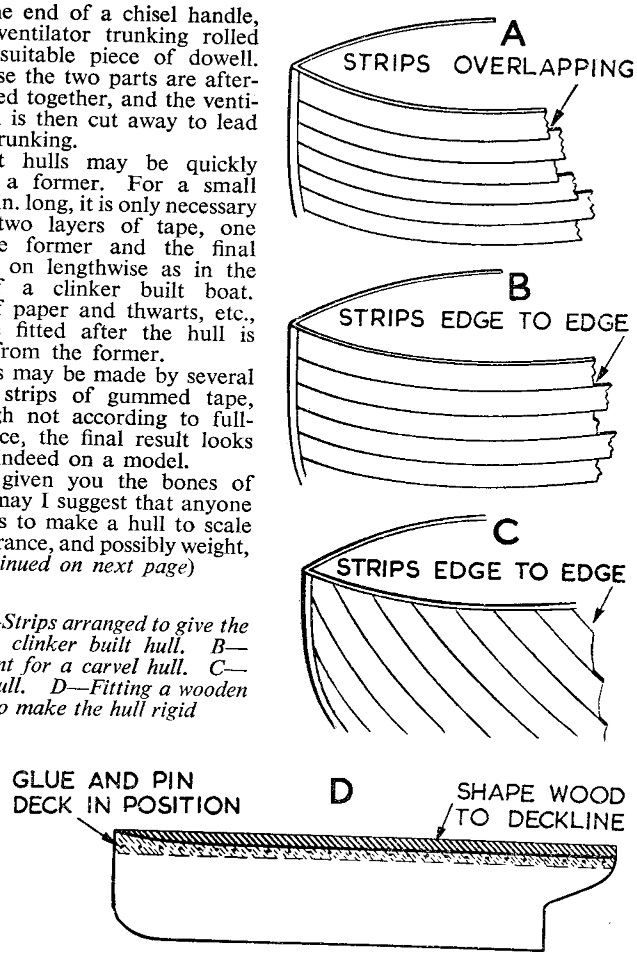


Fig. 4. A—Strips arranged to give the effect of a clinker built hull. B—Arrangement for a carvel hull. C—Diagonal hull. D—Fitting a wooden deck to make the hull rigid

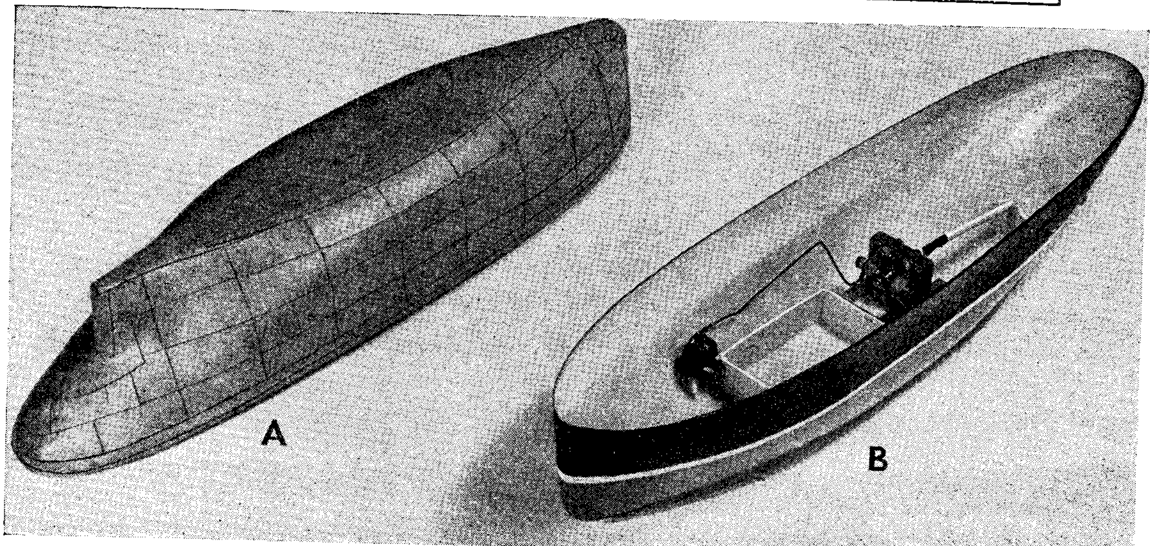


Fig. 3. Top layer of gummed tape adapted to give the effect of a plated hull

For the BOOKSHELF

How to Make Model Aircraft, by P. G. F. Chinn. (London: Percival Marshall & Co.). 92 pages, size $7\frac{1}{4} \times 9\frac{3}{4}$ in. Over 200 photographs. Price 3s. net.

Model makers of every kind have a great deal in common, whatever it is they specialise in building. Many model engineers found what enjoyment could be obtained from making things with their hands, by first building model aeroplanes. Simple to build and great fun to fly, the less complex types of model aircraft can also be a relaxation for the "serious" home constructor. Our companion magazine, *Model Aircraft*, has recently published this new handbook for beginners of all ages, and for those who, having made a start, need some guidance to surmount any problems they may have met.

The seventeen chapters consist of material, revised where necessary, which formed the popular "Beginners' Course," published during 1952/3 in *Model Aircraft*. The constructional chapters are based on well-known kit designs, and are profusely illustrated with step-by-step photographs taken while the models were being made. While the book is written in a very clear and easily understandable style, and takes the reader right from first principles, nothing has been neglected and there are even chapters on soldering, buying second-hand engines, and making up fuels. They not only deal with the construction of all the basic types of flying models, but also take the beginner over the tricky stages of the final trimming and the first flights.

Any parent would do well to buy a copy of this book to set his offspring on the right road, but there is no evidence of "writing down." As we said, it is for beginners of *all* ages, and represents very good value at the low price of three shillings.

Steam Road Vehicles, by C. St. C. B. Davison, Ph.D., M.Sc., F.R.S.A. (London: Her Majesty's Stationery Office). 60 pages, 6 in. by 9 in. Illustrated. Price 3s. 6d. net.

This is an interesting and concise historical survey of the gradual development of the steam-operated road vehicle since 1769. It shows quite clearly that steam vehicles, even in the early 1800s, attained considerable success and popularity, and in spite of difficulties and restrictions during the next hundred years, many forms of such vehicles, including road locomotives and steam wagons, were produced and the designs developed to a high state of efficiency. This book, after an Introduction and a Historical Review, consists of ten chapters, each devoted to a definite period. There are four art-paper inserts to accommodate eight excellent half-tone illustrations, and in the text there are fifteen extremely interesting reproductions of drawings and sketches, most of which are from originals by the author. The book is obtainable from the Science Museum, South Kensington, or from any of the offices of Her Majesty's Stationery Office, or through any newsagent. Copies sent by post are 2d. extra.

How I Became an Engine Driver, by Norman Mc Killop. (Edinburgh: Thomas Nelson and Sons Ltd.). 116 pages, 5 in. by 7 in. Illustrated. Price 5s. net.

The author of this book scarcely needs introduction to railway-minded readers, especially in Scotland where McKillop and the Gresley Pacific No. 60100, *Spearmint*, have together won fame that has spread far over the border. As a writer, too, McKillop is known to thousands; but, do we give away a secret when we identify him with "Toram Beg" of *Locomotive Express*?

He is right on top of his form in this extraordinarily cheap book of his which, once taken up, is so hard to put down. It describes almost every incident that could ever happen in the life of an engine driver, and it contains a remarkably detailed description of the steam locomotive and the men who operate it, at the same time; moreover, it is an *instruction* book which every aspirant to life on the footplate, as well as anyone else with only the slightest interest in the subject should read, learn and, withal, enjoy. We think it is, without exception, the most entertaining book of its kind we have ever seen; we like the plain, simple, forthright style in which it is written and the fascinating manner in which the mood alternates between seriousness and lightheartedness, yet always making the mental picture perfectly clear.

The line illustrations by a fellow-engineman, John Drayton, back up the text admirably; the halftones include close-ups of certain details and some unfamiliar portraits of well-known locomotive types. Of course, *Spearmint* is among them; but that causes no surprise, since there has probably never been a locomotive more carefully looked after or more greatly loved by the man in charge of her. And *his* portrait is in the frontispiece.

LAMINATED HULLS

(*Continued from previous page*)

tries his hand. I am sure that you will find the results most interesting, and it will lead you on to other applications of the process. The photographs shown at the beginning of this article are of the boat that was used as a demonstration model on the tank at the "M.E." Exhibition, and will no doubt be of interest. Hull, bulwarks, lifeboats, ventilators, funnel, grating, mast capping, and mast lamp bands are all of paper. The only trouble you will find in a model made of this medium is that it requires a lot of weight to take the boat down to a scale waterline. Those interested in radio-control operation will find this a great advantage. At the exhibition we turned out many hulls, but in particular I would like to refer to a model hull of a V. & W. destroyer loaned to us by the renowned maker of scale models of ships, Mr. Norman Ough, who was very interested in our process. The hull, approximately 3 ft. 6 in. long, was reproduced in $4\frac{1}{2}$ hours, and will make a very fine model. The tumble-home has been lost, as the sides of the shell have splayed, but this will be corrected by the deck being pinned into position.

This process is also applicable to making puppet heads, chisel and knife sheaths, packing-pieces for lathe tools, etc., but don't forget when moulding, to apply first a layer of tissue, and then the sealing tape on top.

Simple Workshop Appliances

By A. R. Turpin

"THE time has come," the Walrus said, "to talk of many things," including a Turns Counter, an improved Mandrel Locking Device for the Super 7, a Suds Pump, and Gas Blow Torch.

Turns Counter

When winding transformers or coils on the lathe, it is almost essential to have some sort of device to count the number of turns. The device should be simple to fix, so that there is no temptation to do without it when the occasion arises.

In the actual counter to be described, the fitting or removal of the device is only a matter of seconds; in fact, the length of time taken to plug it in to the end of the lathe mandrel. Photograph No. 1 shows the counter plugged into the back end of an M.L.7 mandrel, and Fig. 1 shows a general arrangement of the device. No dimensions are given, because they will depend on the type of counter available, and the bore of the lathe mandrel.

The type shown in the photograph came off some mechanism and was picked up at a "surplus" store for 2s. 6d. — they have none left now. It was already mounted on a platform, and fitted with a 20-tooth gear wheel on its spindle; one turn of the wheel registering 10 digits on the counter. This was mounted on a secondary platform of 10-s.w.g. brass to which was attached a "U"-shaped stirrup, which carried a two-start worm, one turn of the worm turning the wheel through two teeth. This worm was mounted in bearings in the stirrup, as shown, the driving end terminating in a two inch length of steel tube, which was split and sprung open so that it was a nice push fit in the end of the hollow mandrel.

When the mandrel is revolved, the worm also revolves and turns the worm wheel, the weight of counter being sufficient to overcome the torque of the gears. When new, and the gear stiff, this may not be the case, but if this happens, it is only necessary to anchor it with a piece of string to some part of the lathe until it loosens up, or add more weight to the base.

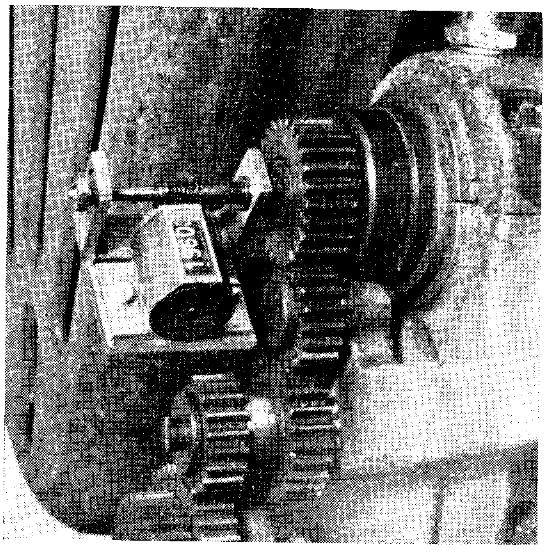
The efficiency of the worm and wheel is not important, and in the case in question, the wheel is an ordinary involute spur-gear and the worm is a Whitworth thread cut on the lathe. If you are worried about making a two-start worm, cut an ordinary thread and multiply the reading by two, or fit a 10-tooth wheel.

Improved Mandrel Locking Device

On the Myford Super 7 lathe, there is fitted an extremely useful mandrel-locking device, but the user is often reluctant to use it because it can only be operated if the change wheel cover is hinged right back, which means unscrewing the locking-screw and in my case, clearing away all the junk that seems to accumulate on the bench on which the lathe is mounted.

This difficulty can be overcome in a very simple way. The mandrel-locking bar is pushed right home into the hole in the mandrel pulley, and a centre dot is then made $\frac{1}{8}$ in. from the back face of the lathe into the locking bar, which is then drilled and tapped $\frac{3}{16}$ in. diameter at this point, and a short length of $\frac{3}{16}$ in. silver-steel screwed into the rod, as shown in Fig. 2. This length of bar, say $1\frac{1}{2}$ in., is then surmounted by a suitable ball knob.

A slot $\frac{1}{4}$ in. wide and 1 in. long is now cut in the change wheel cover, in a suitable position, so that the $\frac{3}{16}$-in. rod and knob protrude through



Photograph No. 1. The turns counter plugged into the back end of an M.L.7 mandrel

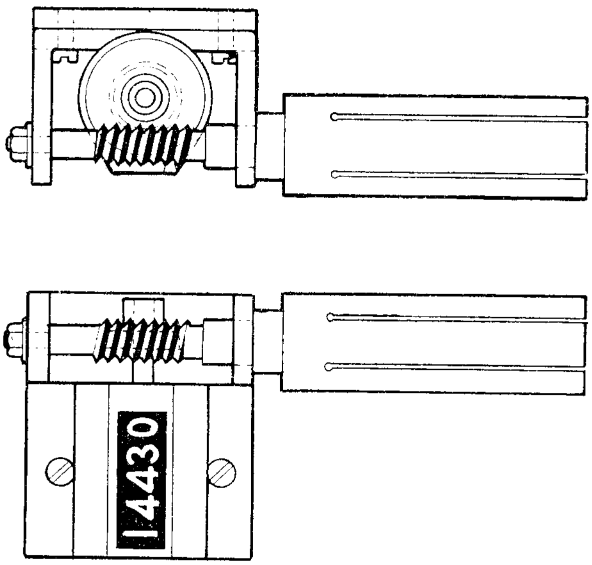


Fig. 1. The general arrangement of the turns counter

the cover, and enables the locking device to be operated without unlocking the back cover. The modification is so simple and so extremely useful—at least to the amateurs who are always changing chucks—that I suggest Myford should incorporate this in future Super 7's; I present the idea to them with my compliments !

Suds Pump

With the coming of the Super 7, and the high spindle speeds available, it was soon found that the application of suds by means of a brush was not sufficient if the full advantage of such speeds was to be taken.

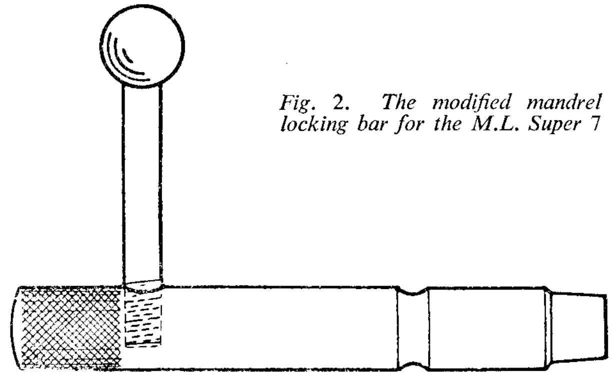
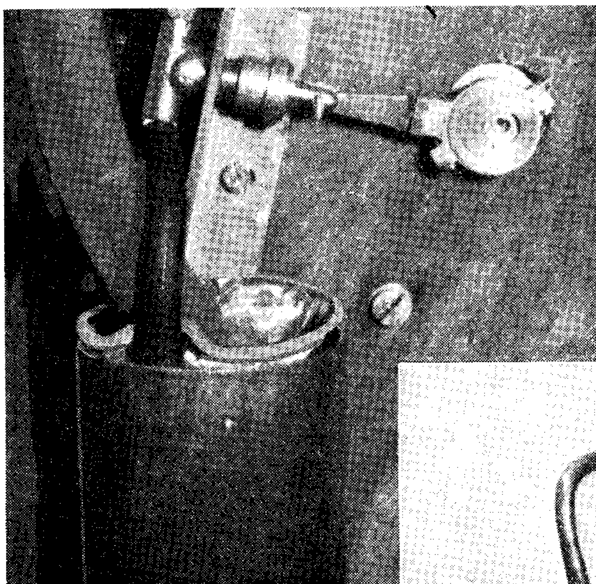
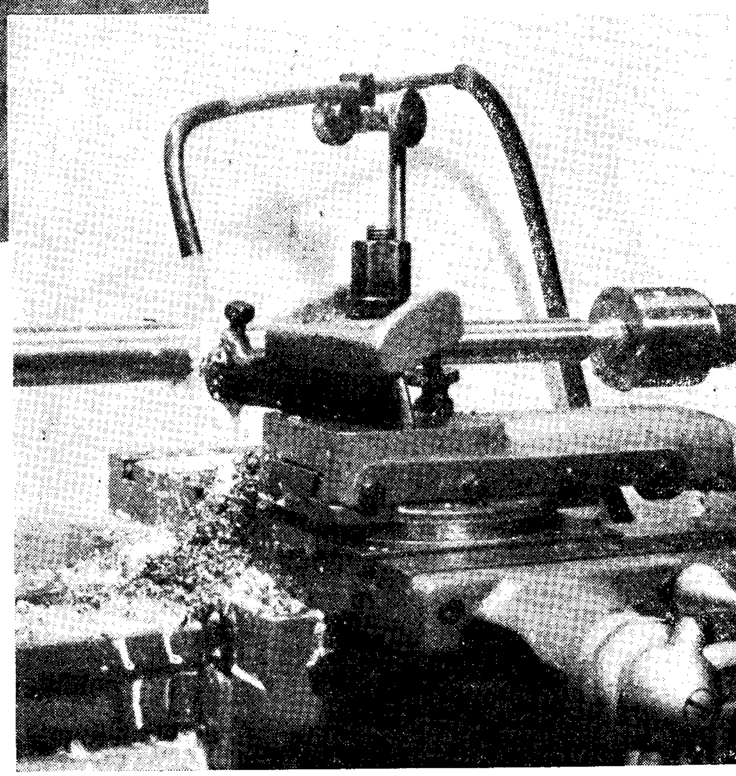


Fig. 2. The modified mandrel locking bar for the M.L. Super 7



Left : Photograph No. 2. The temporary set-up for the suds pump when on trial



Right: Photograph No. 3. The delivery end of the suds supply, showing universal joint so that delivery can be pointed in any direction

As I had an " L.B.S.C." water-pump, as described for *Titch*, I decided to try this out as a suds pump, directly coupled to a $\frac{1}{16}$ in. h.p., 1,450 r.p.m. motor.

Delivery was by rubber pipe having a bore of 3/32 in. diameter, and that is where I made my mistake. The delivery end of the pipe was pointing at the lathe when I switched on; it took a moment or two to prime, and the next second I was covered with suds as the pressure straightened the rubber pipe and pointed the delivery directly at me. Even when held and pointed downwards, the liquid came out with such force that it sprayed all over the workshop.

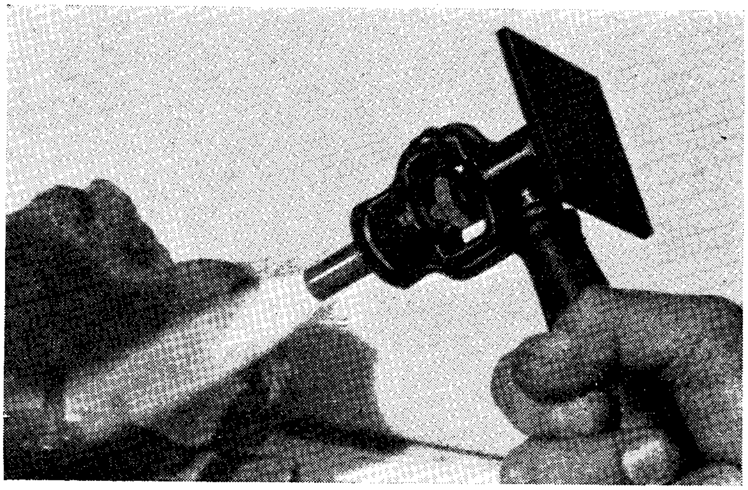
This trouble was easily overcome by fitting a pipe having a $\frac{1}{4}$-in. bore which relieved the pressure somewhat, but finally I reduced the stroke of the pump down to $\frac{3}{16}$ in., and in this condition it worked perfectly, the eccentric being given a squirt of oil every half hour.

At the high r.p.m. used, the flow appears to be quite continuous when using the large bore pipe, but it was found that the slightest bit of dirt tended to put it out of action. For this reason, a petrol gauze filter having a comparatively large

area was used at the intake, and a tray of the same material was used to catch any swarf that got past the comparatively coarse drip tray filter, which consisted of a number of $\frac{1}{16}$ in. diameter holes drilled in a dome knocked in the bottom of this tray, which had been constructed from a sheet of 18 s.w.g. copper. The whole set-up was mounted on a piece of $\frac{1}{2}$-in. plywood securely bolted to the bench legs, see Photograph No. 2 and Fig. 3.

When turning a long shaft at high speed it is remarkable what a difference in finish is obtainable when suds are applied with a brush as compared with that obtained when a copious supply of liquid is flooded over it by pump.

Some care must be taken in an amateur's workshop to prevent drowning oneself in soluble oil, and if working near the chuck face, I prefer to use a brush because if the suds get on to the chuck face they get thrown all over the place; but with practice, it is possible to place the suds outlet in such a position that it is possible to work quite close to the chuck face without this happening.



Photograph No. 4. Showing the gas torch in use

When the pump was fixed under the bench and hidden from sight, it was too easy to forget the application of oil to the eccentric, so the pump was fixed at an angle of 45 deg., so that some of the drops of suds were allowed to escape by loosening the packing gland. These run back and lubricate the eccentric, and as they have to pass the fine clearance of the plunger, plus the packing gland they are pretty well filtered. The drops are caught by a splash plate and guided back to the container.

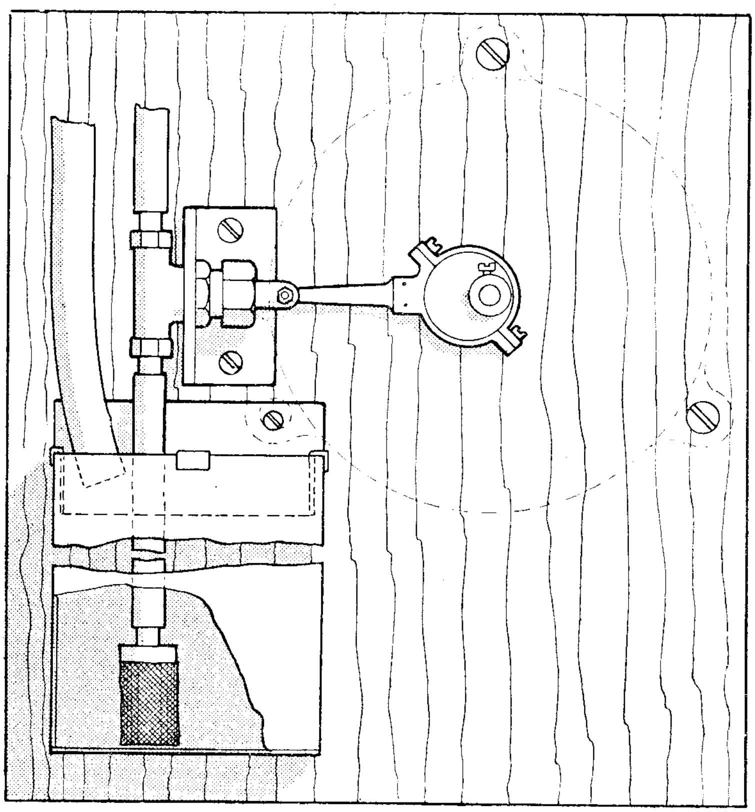


Fig. 3. The suds pump

Universal Gas Torch

This is an extremely simple torch to make, because most of it consists of a standard gas injector. These can be obtained in various sizes from your local gas undertakings—go to the "stores" not the showroom—for a few shillings. They are obtainable in various sizes, the smallest $\frac{3}{8}$ in. and the largest $1\frac{1}{2}$ in.; these sizes refer to the size of gas barrel that will screw into the injector casting. About the largest size that can be used off an ordinary domestic supply is the $\frac{3}{4}$ in.; if a larger size than this is used, the gas velocity is not sufficient to draw in the maximum amount of air required. The injector is shown in Fig. 4, and it consists of the following parts: the main casting *A*; a brass venturi tube *B* which screws into the casting; the jet *C*, which is adjustable so that the amount of air drawn into the venturi tube can be controlled; this jet can be locked in any position by the locking-screw *D*. The gas inlet can be connected from two alternative positions, the one not required

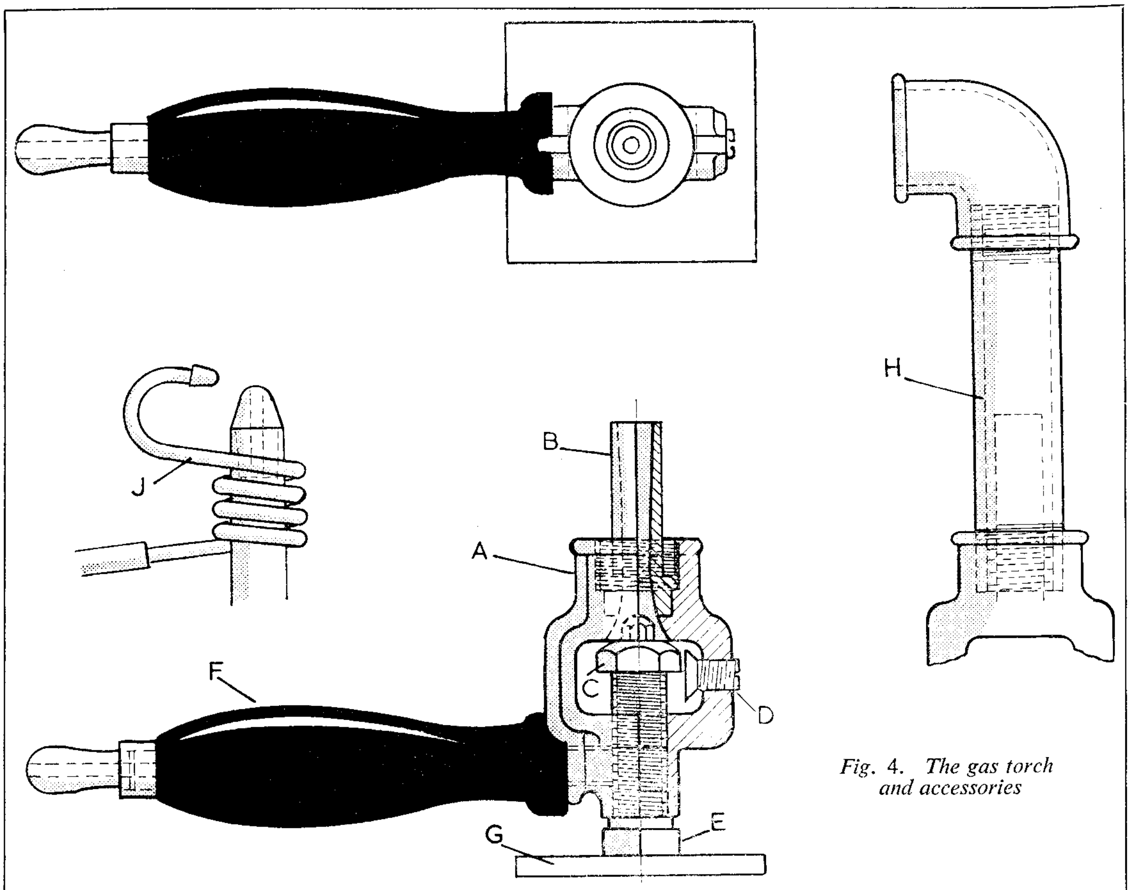


Fig. 4. The gas torch and accessories

being closed with the brass plug *E*.

In order to turn this injector into a brazing torch, a handle *F* was taken from an old gas poker, and screwed on to the right-angle connection, and in order that the torch could be used as a plain bunsen burner, a 2-in. square of ¼-in. mild-steel *G* was silver-soldered to the plug *E*.

If required for heating an oven, the gas barrel *H* is screwed into the casting and the convector laid on its side with the elbow pointing upwards, the air control being adjusted to give a nice bushy flame.

As a torch for silver-soldering, the air is adjusted so that it just burns without popping back. For fine work it can easily be converted into a jeweller's blow pipe. A coil of ⅛ in. diameter copper tube *J* is wound round the venturi tube with the top end bent into a "swan's neck" and capped with a brass cap drilled No. 70 or thereabouts. The other end is connected *via* a rubber tube to a mouthpiece of bone, plastic or ivory. The air vent to the bunsen is closed and the gas turned down to give about a 3-in. flame; the capped end of the coil is adjusted so that it is, say, half-an-inch above the end of the venturi. Blowing down the tube should cause a needle of flame to shoot out at right-angles to the main flame. The hottest part of this flame is about two-thirds along it, and should be capable of fusing 22-s.w.g. copper wire.

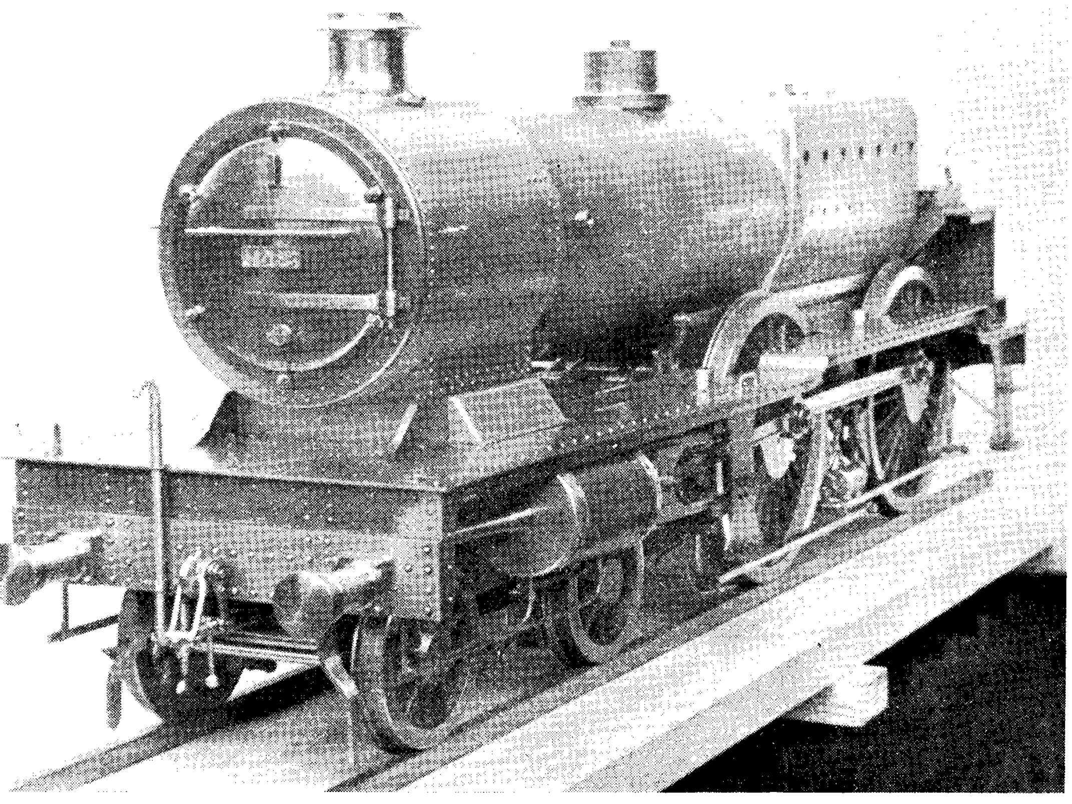
Some practice is required when using a blow-pipe, in order to keep up a continual pressure of air; breath is taken in through the nose and the cheeks used as a reservoir to keep the pressure up whilst this is being done. If the outlet hole is too large, such procedure will be found very difficult.

L.B.S.C.'s Lobby Chat

● THE OLD-TIMERS COULD RUN !

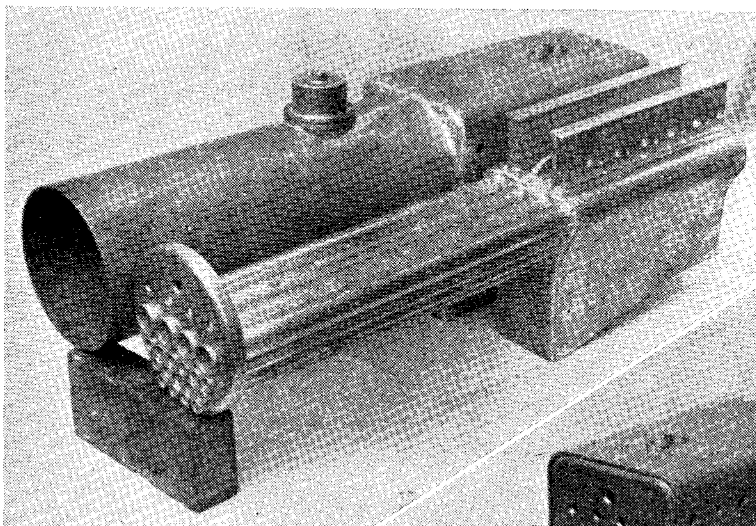
MENTION of fast running with old-time excursion trains, in my Christmas Lobby Chat, has prompted several readers interested in train timing, to ask if I have any detailed logs of outstanding runs. At one time I had quite a number, including the one when a Stroudley *Gladstone* made an unofficial record with the Sunday Pullman Limited which has never been equalled, let alone beaten. It was done in six minutes under the " official " record made by Jack Tompsett with the Billinton 4-4-0 *Holyrood.* When the driver was " carpeted " for exceeding the limit, he told " old Bob," there was more " go " in a Stroudley *tender* than in any of the latter's engines, and got a fortnight's suspension. I gave the last of my logs away, long since, and have no more. As I said in the Lobby Chat, memory is growing dim now, and though I can recollect several runs that would compare very favourably with those of the present day, I am unable to give the exact figures. Approximations would hardly be acceptable to stop-watch wallahs ! There was quite enough fuss made over the late Mr. Charles Rous-Marten's record of 102 m.p.h. by a G.W.R. 4-4-0 with the Plymouth Mail, down Wellington bank ; personally I don't doubt it for one minute, as I know the road, the engines, and remember the lads who worked them. However, there are others—nuff sed !

Before the advent of the Sunday Pullman Limited, our fastest booked run on the L.B. & S.C.Ry. was the 5 p.m. from London Bridge to Brighton, allowed 65 minutes for the 50½ miles. The train was made up of special first-class stock, and weighed over 300 tons. It was invariably hauled by a *Gladstone*, as the Billinton " grasshoppers " couldn't keep time with it for toffee-apples. This timing, on paper, doesn't seem anything to write home about; but when the road is considered, and the fact that these engines weighed only 38 tons (less tender, naturally) and carried only

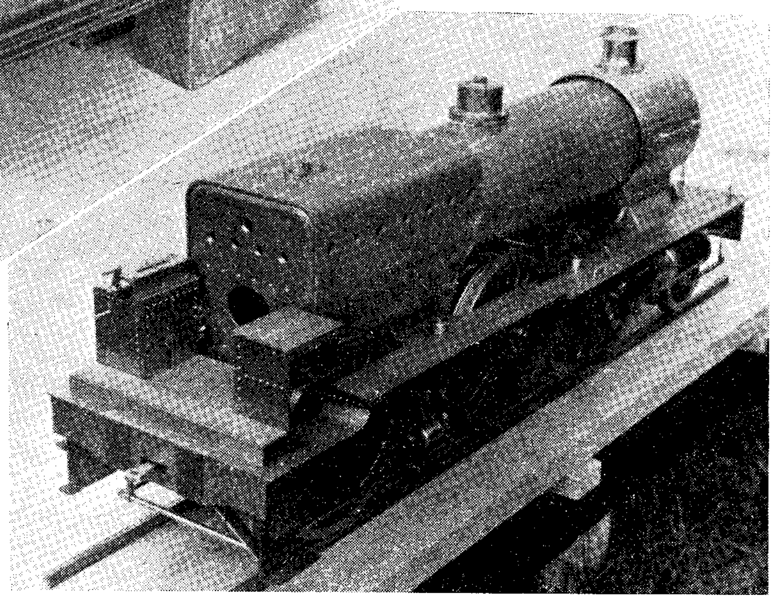


The modern " Webb Compound " nearing completion

150 lb. of wet steam, it was a jolly good show. After pulling out of the City station, the old girl would set her back into it, and would be doing about 70 m.p.h. by the time she passed New Cross; the three-mile bank of 1 in 100 up to Forest Hill, was enough to damp her ardour. As soon as she got up in the seventies again, by about Norwood Junction she had to face another eight miles of "collar-work" up the 1 in 264 to Merstham Tunnel. After surmounting that, she would gather up her skirt once more, and sprint like the dickens to Horley, only to encounter six more uphill miles to Balcombe Tunnel. Nothing daunted, she would wipe that off, and after breasting the summit, would make a frantic dash down to Wivelsfield, usually passing Haywards Heath well up in the eighties. Then up would go her smokebox skyward for another six-mile spell of hard pulling, to the south end of Clayton Tunnel. You could hear her sigh with relief as she emerged, panting but very far from breathless, from the south portal into the open air, and surveyed the drop down into Brighton. She would take the last bit easily, and come to rest at the long platform, "spot on" with the station clock.



Boiler parts ready for assembly



Below: Nice work !

She and her sisters were all well known to the crowd of City "regulars" who streamed past, and many an admiring glance was cast at her shining yellow dress, polished copper chimney top, and gleaming steel-work; and one could imagine her quietly saying: "Well, gentlemen, once more—we're here !" The drivers and firemen in that particular link were also "old friends"; and it was no uncommon sight to see the 'big boss" of some City executive, or a well-known stockbroker, or some other business notability who travelled on the train each day, passing a cheery greeting to the lads on the footplate. We never found any silly snobbery among the "real" folk ! Incidentally—if you can imagine such a thing, in this year of disgrace 1954, with its high fares—these good people who lived at Brighton and worked in London, enjoyed their 50½-mile non-stop run, in a first-class carriage, *for less than one shilling*, by taking out a yearly season-ticket. Fifty per cent. less than the cheap tripper paid for his ride in a "workmen's third." The "Brighton" always believed in the gospel of low fares and full trains; and it is a thousand pities that British Railways cannot be brought to the same way of thinking—nuff sed !

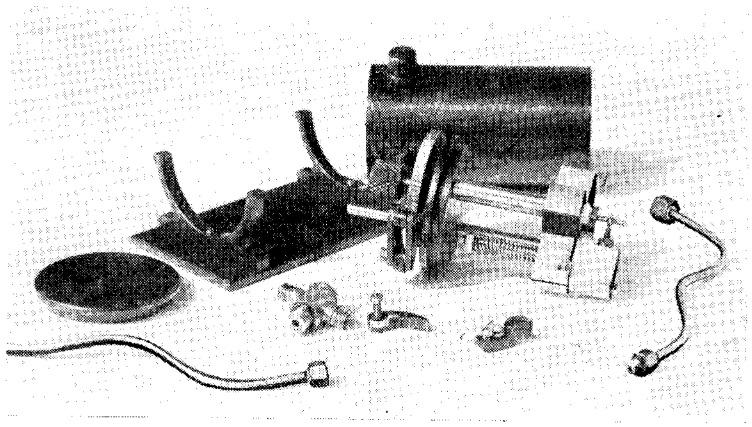
A Fine Run on the L.C. & D.R.

Around the turn of the century, the travelling public used to "guy" both the South Eastern and the London Chatham and Dover Railways, for their alleged slow running. Old readers of this journal may recollect the music-hall song of the old farmer who visited town:

"Oi kim oop by train, and the
  journey were foine
By the Lunnon and Chatham and
  South Eastern loine;
Of snails and tor-toyses and sich,
  Oi've heerd talk,
But if Oi'm in a hurry to get whoam
  —*Oi'll walk* !"

This was decidedly unfair, because the L.C. & D.R. in particular, had a heavily-graded road, worse than the L.B. & S.C.R.; nevertheless, the engines could pop along all right when occasion demanded fast work. Now I have in front of me at this moment, a special traffic notice, dated Saturday, November 12th, 1898. The Grand Duke and Grand Duchess Serge (of Goodnessknows-whereski) were paying a friendly call on Queen Victoria at Windsor, and the L.C. & D.R. were providing a special train to run them right through, from Dover Pier. I also have the running sheet. The engine

was a Kirtley 4-4-0 of class M3, No. 15, in charge of Driver N. Tollervey. The load consisted of two saloons, two first-class coaches, and two brakes; six vehicles all told. The train was scheduled to leave Dover Pier (now Dover Marine) at 2.55 p.m., but didn't get away until 3.2 p.m. However, Driver Tollervey happened to be one of those merchants whom the stop-watch fraternity call "enterprising," and he gave his black lassie her head. She responded to such good purpose that, with her modest 150 lb. of wet steam, she barged up the seven miles of 1 in 132 like nobody's business, and left Shepherd's Well Tunnel at a good 38 m.p.h. "Over the top and the best of luck," she thought, "now we'll show the Russkies what the old Smashem-and Turn-over can do." She stretched out to a gallop, and buzzed through Canterbury at a mile a minute, not even pausing to blow a kiss to her old sister *Invicta*, so that she could rush the short bank to Selling Tunnel; then she put on a spurt, and went through Faversham at 62, holding it over the switchback to Chatham, where she had to ease up to 45 on account of the sharp curves. This prevented her from getting a run at the five miles of 1 in 100 up to Sole Street, but she snorted up the long drag without losing any more way. It was then that she decided it was time to give the royal passengers a bit of a thrill, so she went all out and reached the seventies, flew through Farningham Road, bounced over the Swanley hump, and dropped down through Bickley and Bromley, until her mad fling was checked by the junction at Shortlands, where she eased to 48. Another sprint down the dip through Beckenham helped her to rush the rise to Penge Tunnel, then she speeded up to the fifties again through the London suburbs. Approaching Wandsworth Road, she slowed down to 43 for Factory Junction, where she took the long spur leading to the West London line. Leaving this again at Longhedge, she bore left, and ducking her shapely chimney under the main lines of the L.B. & S.C.R., and the L. & S.W.R. she "came to the surface" again on the west side, at Ludgate Junction, where the spur joins the Windsor line of the latter company. Not knowing her way any further, she stopped here, and picked up a L. & S.W.R. pilotman, to show her the road to Windsor. She had recovered six of the seven minutes lost by the late start from Dover!



Parts of drum-type mechanical lubricator

Three minutes elapsed before she could get going again, but she soon got into her stride; and just to show her green South-Western sisters that the Chatham engines weren't so black as they were painted, she proceeded to knock off the remaining 22 miles to Windsor in 29 minutes, despite two bad signal checks before Putney, and another at Isleworth, which nearly brought her to a dead stop. She finally landed her load of Russian nobility "right on the dot" at Windsor; and notwithstanding her unladylike antics in making up seven minutes in a run of 99½ miles, she still had 15 in. of water left in the tender tank.

Good Going!

The 76 miles from Dover to Wandsworth Road (Factory Junction) took 72 minutes, net, giving an average speed of 62 m.p.h. as near as makes no odds. Allowing for the three-minute stop at Ludgate Junction to pick up the pilotman, the two signal checks, and the near-stop at Isleworth, the average speed for the whole trip, Dover to Windsor, worked out at 58.81 m.p.h. The figures are not my own, but were taken from the running-sheet mentioned above; and that, mark you, with an engine very small indeed, compared with the express passenger engines running at the present time. Her slide-valves had only 3¾ in. travel in full gear, and were operated by Stephenson link motion; coupled wheels 6 ft. 6 in., cylinders 18 in. × 26 in. and boiler pressure 150 lb. wet steam. She was built at Longhedge in 1895. Makes you sit up and take notice, doesn't it? History doesn't record whether their Royal Highnesses the Grand Dukeski and his good lady, said a gracious "thank you" to Driver Tollervey!

The "Webb Compound" Nearing Completion

Regular followers of these notes will recall that when Mr. A. J. Webb, of Birmingham, wrote me about building a *Maid of Kent* 4-4-0 with outside cylinders, and dolling her up with L.M.S. boiler mountings and superstructure, to resemble a "Crimson Rambler," I advised him to "go the whole hog" and make her a real three-cylinder compound. Anybody bearing the name of Webb, who built a "compound" that wasn't, would be committing pure sacrilege! "Bro. Spider" was tickled pink with the idea, and promptly got busy. I have already reported some of the progress made, in a previous article; and I now have the pleasure, thanks to our worthy friend, of offering views of the engine as she nears completion.

To Do its Job

As the pictures plainly show, the workmanship is of a very high standard; but Mr. Webb says that first and foremost, he concentrated on building a locomotive that would do the job in the approved manner. Photographs of the assembled and erected working parts have already been shown; and the boiler shell, with the "inside" complete, can be seen in the accompanying illustrations. The plates are properly flanged, the joints brazed, and crownstay girders fitted. Note that these come right to the edges of the firebox crown; this is important, and is shown in all my boiler drawings. The bottom flange of the girder should in all cases bear on the

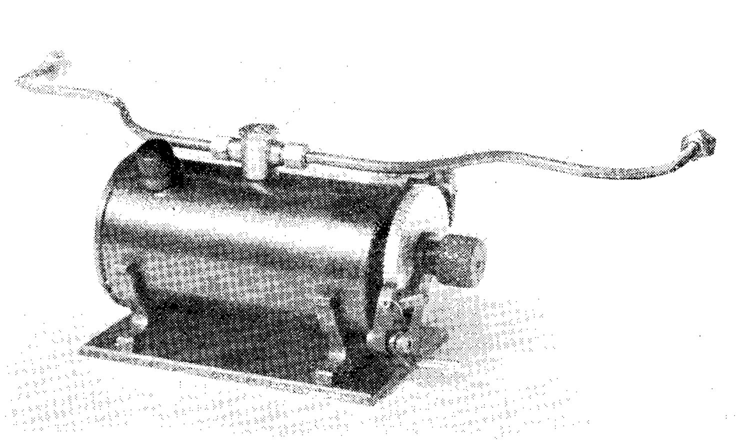
flanges of the tube and door plates, with, of course, the thickness of the crown-sheet between. Two or three of the good but misguided folk who think they know all the answers, have fitted girder stays that did not extend the full length of the firebox, with the result that under test pressure, the crown-sheet has come down between the flanges of the tube and door plates, and pulled the top of the wrapper down with it. They at once start to shout that the girder staying isn't satisfactory; when all the time, the sole trouble is that they don't faithfully follow the instructions for making and fitting girder stays. If the girders bear on the tube and door plate flanges, as stated above, it is impossible for the crown-sheet to come down without collapsing the ends of the firebox as well, or tearing away from the girder flanges. Either catastrophe could only occur through exceedingly bad workmanship.

The imposing array of pimples are there, not for the sake of making the engine look pretty, but to do the same job that they do on the full-sized engines, viz.: hold the parts together; and a very neat job "Bro. Spider" has made of putting them in. Whether he has the same number as big sister has, doesn't matter a Continental. As his *Hielan' Lassie* has already shown her prowess, not once but many times on the Birmingham club track at Sheldon, there will be no question as to how the compound will perform; and so here's wishing the best of luck to the engine and her painstaking and energetic builder.

A Drum-type Mechanical Lubricator

Locomotive-builders who follow these notes, from time to time make variations in components which I have described, to adapt them to some particular job. A case in point is the drum-type mechanical lubricator which is illustrated here. Our good friend Harry Dixon, of the Golden Gate Live Steamers, has been overhauling and repairing the 3½-in. gauge Boston and Albany tank engine belonging to Capt. G. B. Kubicek, who was a prisoner of war in Korea, and has lately returned safely home. A drum-type lubricator suited this engine best, and so Harry made one, but put an oscillating-cylinder oil pump in it, of the same type that I describe for my "standard" jobs, but adapted to the round tank. The entire unit is made from solid steel, except the pump body and pump cylinder, which are of bronze. The passageways were drilled in the body, so that they would come out at the top, where the check valve is screwed in, after fitting the pump into the tank.

The ratchet gear is made up from rustless steel, the wheel being extra large, with 72 teeth, which was necessary to compensate for the eccentric drive which was already set up on the engine; and to complete the drive, a jack shaft was added. The covers on each end of the tank are just a snap fit. A knurled knob is provided on the pump shaft, so that a drop of oil can be pumped into the steam-chests by hand, while the engine is getting up steam. The round casing of the lubricator adds to the appearance of the engine, as it is located on the running-plate just in front of the smokebox. The steel is treated by an anodising process, to prevent rust on the outside. The whole job was made out of odds and ends of stock on hand, and our friend of the Dixie Short Line has certainly made an ingenious adaptation. I passed him a silent but very hearty vote of thanks for sending me two bits of corrugated cardboard in an envelope, the corrugations being entirely filled up with a nobby collection of weeny springs, which will come in mighty handy for my own work on lubricators and similar gadgets, and save valuable time.



Mr. H. Dixon's mechanical lubricator

Passing Thoughts

Isn't it curious how some folk overlook the obvious? A short while ago, an enthusiastic schoolboy wrote me that he had hit on a method of simplifying the making and fitting of my usual type of emergency tender pump. Incidentally, I love to hear from the young folk, as it makes me feel young again, as if I were one of them. What "sonny" suggested, was to cock the pump up on end, dispense with the lever, and fit a knob direct on the end of the ram. I'm afraid that he had an awful shock when I pointed out that with the valve-box horizontal, the valve balls wouldn't stay on the seatings, but would allow the water to run back into the tank when the ram was operated. Vertical hand pumps have, of course, been made "since the year dot," but they have vertical valve-boxes. I fitted one on the footplate of my old 2-2-2 well-tank engine *Ancient Lights*.

I have a fountain-pen with a very wide-pointed nib, which I use for addressing postal packets; and just recently it rolled off my drawing-board on to the floor, without my noticing it. It goes without saying, that I trod on it, and crushed the barrel. Some of ma ancestors cam' frae across the Borrrrrderrrr, ye ken, sae I wisna goin' tae spend ma bawbees on a new yin, juist tae address wee packets; so I cut a piece of gauge-glass tube to the length of the barrel, turned the screw off the nib section until it was a tight push fit in one end of the gauge glass, put a little cork plug in the other end, and Jock was my uncle. The pen has worked perfectly ever since, and I can now see how much ink there is in it—hoots, mon, awa' wi ye! I dinna like ball-point pens, as ye canna fill them oot o' the inkpot in the post-office!

Have you ever heard of the engine-driver whose name was Leonard Arthur Thomas Evans? No matter how much he tried to run to time, he was always L.A.T.E.!

MORE UTILITY STEAM ENGINES

A Double Tangye Type Mill Engine

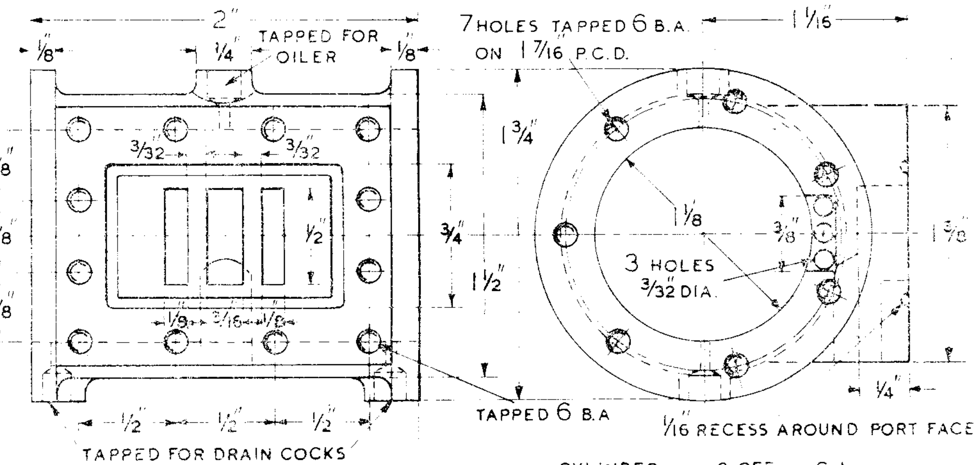
By Edgar T. Westbury

IN connection with the remarks in the introductory description of this model, I have been asked what constitutes an "adapted" prototype design, and why it should be necessary to adapt the design of a recognised prototype at all. The opinion is expressed that the model is either a faithful scale replica of the full-size engine in all its details, or it is not; and in the latter case, the design has no fidelity value whatever. This is one of those "awkward" questions one is often confronted with in the course of open discussion, and which appear unanswerable until one has had a chance to think them over. I would assure readers, however, that there is not only a logical reason for the adaptation of a prototype design, but also in many cases a real necessity to do so, in order to make it suitable for model construction within the facilities of the average model engineer.

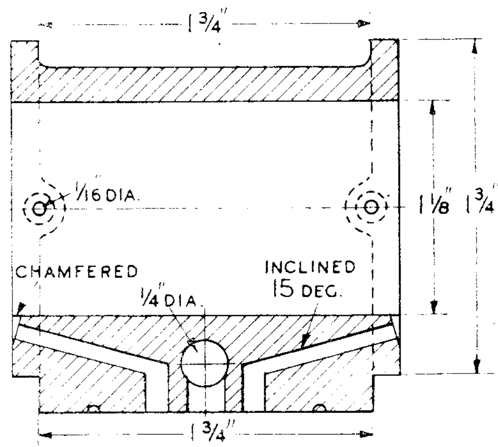
Continued from page 6, January 7, 1954.

While it is not impossible to copy every tiny detail of a full-sized engine with meticulous fidelity, it is rarely done in practice, even by the most conscientious model constructors; and in any case, the full-size methods of construction are in nearly every case inapplicable in small-scale reproduction, so that minor modifications become necessary to suit the processes used. These generally include simplification of details to avoid difficult fiddling operations, which in any case would hardly be justified by any improvement in the appearance of the finished model. Furthermore, if the model is intended to work more or less efficiently, the working parts, whether visible or otherwise, usually call for some modification.

There have been a fair number of outstanding models made by readers of this journal, in which the most scrupulous care has been taken to preserve accuracy in all details, in order that the model shall be a true representation of its prototype. These constructors usually carry out a considerable amount of research



CYLINDER 2 OFF C.I.

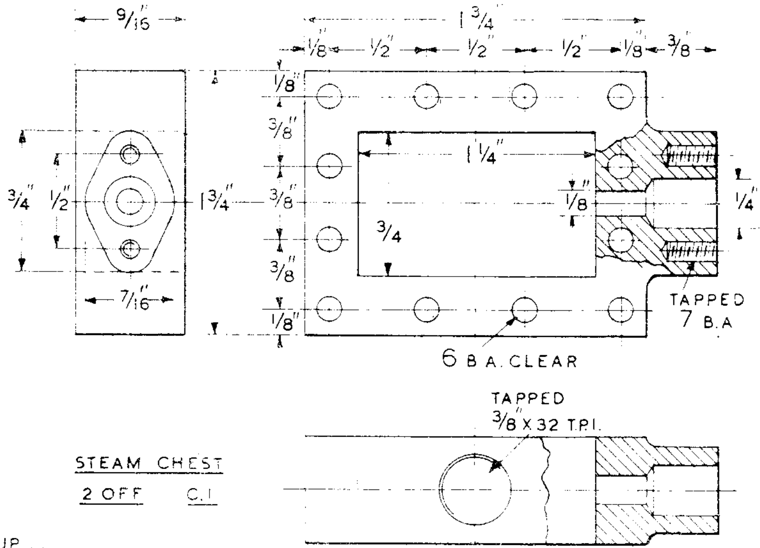


work in order to make this possible, often by reference to the actual example, entailing dismantling and measurement of its components, where the prototype is available; and the results have generally justified the care and patience devoted to the task. So far as I am aware, complete details of these models, though often asked for, have never been published, and I believe that their constructors would agree with me that they would hardly be suitable subjects for popular designs, to be made up from castings, with the limited facilities of the average model workshop.

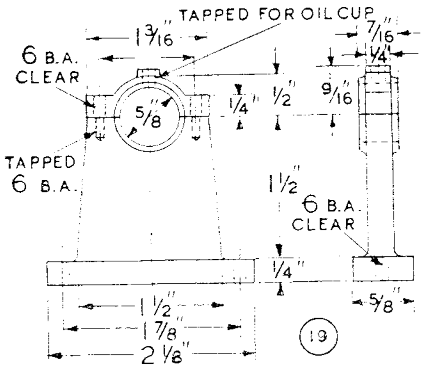
When it comes to modelling a type of engine, as distinct from an individual historic engine, the question of fidelity is complicated by the fact that the makers of the full-size engines often introduced variations into the details, and in some cases a careful examination of a number of engines of the same make and general type shows that hardly any two of them are exactly alike in all respects. This, of course, refers to engines made before the mass production era!

In the case of the Tangye engine now under consideration, most of the information has been obtained from the description of Mr. Ballantyne's model, plus observation of other models of both double and single type, and castings of this engine which I believe were supplied by the Liverpool Castings and Tool Supply Co. The available details, obtained from all sources, are still incomplete, and I have had many gaps to fill in; furthermore, I have taken the liberty of modifying certain items, mainly with a view to simplifying methods of construction. At the same time I have taken great pains to preserve the salient features and general characteristics of the design, which I believe to be more important than exact details.

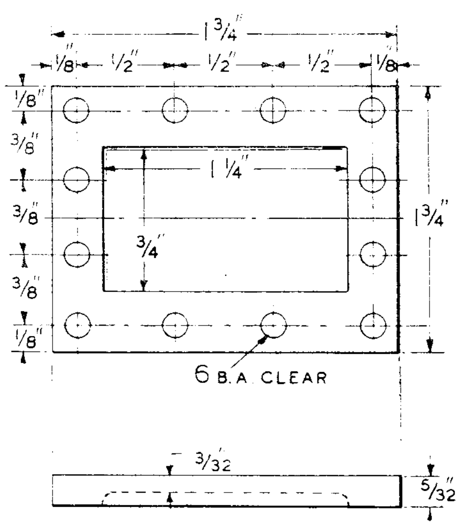
I trust that this satisfactorily explains how and why the design has been adapted, and also that it will fulfil the conditions which are implied by the term "representative prototype working model."



STEAM CHEST 2 OFF C.I



BEARING STANDARD 2 OFF C.I.



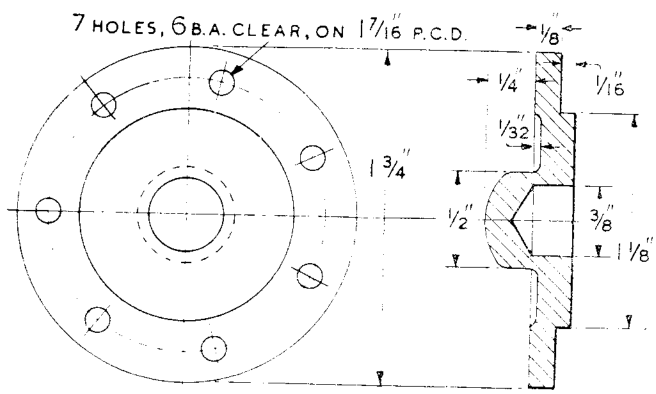
STEAM CHEST COVER 2 OFF C.I.

Main Bearings

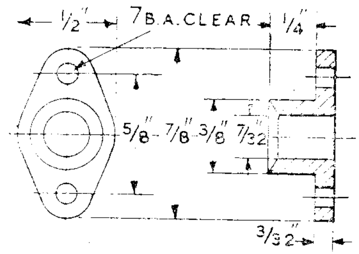
The housings in both the main casting and the separate bracket are split, and the fitting of the caps should be carried out before boring. In the case of the main casting, the bearing is split at 45 degrees to the horizontal line, and the machining of the surface, to enable good contact to be made with the cap, involves rather elaborate setting up for such a small job, though it can be done by using the vertical back surface of the casting as a bolting face, the job being packed up on the cross-slide to a convenient height for face milling. It is not, however, essential to machine this face, provided that it is filed accurately flat, and square crosswise, to avoid risk of distorting the bearing when bolted down. The dividing line of the housing should exactly intersect the centre line of the trunk guide, at a distance of $5\frac{3}{4}$ in. to the cylinder flange face, as shown on the drawing: the two main castings may be placed back to back to make certain that they correspond in this respect.

If the caps are cast separately, they can be machined on the lower face and the stud holes drilled, then used to mark off the tapping holes in the main casting. But if they are cast in one piece with the latter, so that they have to be separated by sawing through the dividing line, it is best to drill the holes before detaching them, thereby ensuring that they will go together in correct alignment.

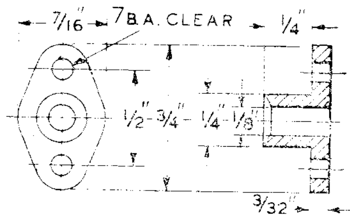
Split bushes are specified for all four main bearings and this, of course, is correct practice, but the need for them could be avoided by



REAR CYLINDER COVER 2 OFF C.I.



PISTON ROD GLAND 2 OFF BRONZE



VALVE ROD GLAND 2 OFF BRONZE

running the shaft directly in the housings, the latter being bored to shaft size and split as specified. From the purely practical point of view, there is something to be said for this practice, as very small split bushes are by no means as easy to fit and bed in properly as one might think. Anyone who has had experience of fitting split bearings in full size engines will realise that to fit small bearings to scale accuracy, both inside and outside, is a very highly skilled job.

Whether the inner split bushes are fitted or not, however, the housings can be bored by swinging the casting round on the cross-slide so that the axis of the trunk is parallel with the faceplate, which may be checked by placing a $\frac{5}{8}$ in. diameter mandrel in the guide bore and measuring from the two ends. It is necessary to use a smaller bar for boring these housings, but it can be kept short and stiff, and a reamer, or alternatively, a bar with a fixed double-ended sizing cutter, can be used for finishing. The sides of the housing should be cleaned up with a facing cutter, either of the single-point or face mill type; if the rotation of the lathe is not reversible, separate cutters for right and left-hand respectively will be required.

Bearing Standard

Before boring the housing of this casting, which is dealt with in the same way as that of the main casting, the under surface of the base will have to be machined, to bring the centre height to $1\frac{3}{4}$ in., and this may be done by holding it by the top end in the four-jaw chuck. In this case it is quite easy also to face the top seating for the bearing cap, by reversing the casting in the chuck. After fitting the cap and bolting it in position, the casting is mounted on the packing plate on the cross-slide for boring and facing the housing.

A mandrel should now be made, about 5 in. long, of a diameter to fit the bore of the bearing housings, slightly on the tight side so that it can be clamped by the bearing caps. The two main castings and the inner bearing brackets are mounted in their correct respective relations, and the correct distance apart, after which they are checked to ensure that the bases are all lined up at the same level, and if not, any necessary corrections made until they will all indicate proper contact when tested on a surface plate. They can then be used to spot the positions of the fixing holes in the bedplate, which is drilled and tapped as required.

Cylinders

It is unnecessary to describe the machining operations on these in detail, as they can be dealt with in the same way as the cylinder of the "Unicorn" engine, or alternatively, by methods which have been described many times for cylinders of locomotives and other engines. There are, however, one or two minor differences which, while not affecting methods, may be worth mentioning. It will be seen that the steam-chest face of the cylinder does not extend the full length, up to the flange faces, as in the "Unicorn" engine, but it is advisable to take a facing cut on the ends while the casting is set up for machining the flanges; at the same time the outer edges of the flanges can be turned, to match the diameter of the rear cover, and the trunk standard flange.

The front cover is of unusual design, as it is not provided with a bolting flange of the same diameter of the rear cover, but only a spigot which fits the recess of the trunk flange, and is sandwiched between this and the cylinder. Care must be taken to see that this is nipped endwise, while leaving a slight gap between the bolting flanges, and furthermore to tighten the studs evenly all round, the evenness of the gap being checked by feelers, on final assembly.

Odd Numbers!

It will be seen that there are seven holes in each flange (the designers of this engine seemed rather fond of odd numbers), and the spacing of these is not quite so easy as where even numbers are used, as the angle between each is approximately 51.42 degrees. If, however, one can rig up some means of indexing the lathe mandrel, no matter how primitive, it can be done by using a 35 change wheel—or any wheel with a number of teeth which gives multiples of seven. Should any constructors decide to use a different number of cylinder studs, watch out that they will dodge the chamfer and the drilled ports—quite an obvious precaution, one might think, but I know of at least one case where a dummy stud and nut had to be fitted to a cylinder because it was overlooked; which, as they say in "1066 and All That," is a *bad thing*.

The ports in these cylinders are again unnecessarily large, which makes them easier to produce with reasonable accuracy, and is certainly no detriment from the working

aspect. They can be cut by the method described for the " Unicorn " engine, or by end-milling in which case the ends will be rounded instead of square-cornered as shown. A point which is worth mentioning is that in end-milling ports, it is rarely safe to use end-mills of a diameter equal to the specified width; they nearly always tend to cut somewhat on the large side, especially if they do not run perfectly truly, and the effect of any spring, or end play in the slides, is to make them cut larger still. Discretion urges the use of smaller cutters, and enlargement of the ports by taking side cuts if necessary; these small cutters should be run at the highest speed possible (in the lathe mandrel or cutter spindle) and light cuts taken.

I have had several queries from readers who have inadvertently made ports too large, and have wondered whether they have scrapped the cylinder castings thereby. They may be reassured that if the errors are not too bad, it is generally possible to save the situation by modifying the slide valve to suit the size and location of the ports, unless the end clearance in the steam-chest is too limited to allow of such alterations. First see that the length of the slide-valves cavity is exactly equal to the distance between the inner edges of the cylinder communicating ports, to give " line-for-line " exhaust timing; then adjust the length of the slide-valve face to give the specified amount of lap at each end. This, of course, assumes uniformity and symmetry of location of the cylinder ports; the exhaust port is relatively unimportant, both in size and location.

The port face on these cylindèrs is shown as completely surrounded by a " moat " consisting of a shallow channel end-milled or otherwise formed in the flat surface. This provision s practically universal in full-size engines, and its object is to prevent the formation of ridges when wear of the valve face has taken place. As a matter of fact, the usual method is to cast the port face as a projection, which is subsequently machined, and the metal around it is left unmachined, well below the level of this face. In models, however, it is far more usual to leave the whole surface flat, because if and when adjustment for wear ever becomes necessary, it is much easier to re-surface the entire port and joint face together than to attempt local treatment. The " moat," therefore, may be regarded as a purely optional feature.

Steam Chest and Cover

These also conform to conventional model practice and call for no special comment. In Mr. Ballantyne's engine, extra countersunk screws were provided in the steam-chest, presumably with the object of holding this in place when the cover is removed, but I have not considered it necessary to fit these, as I have not found any tendency for the steam-chest to shift, or the joint to be in any way impaired, under these conditions.

Glands

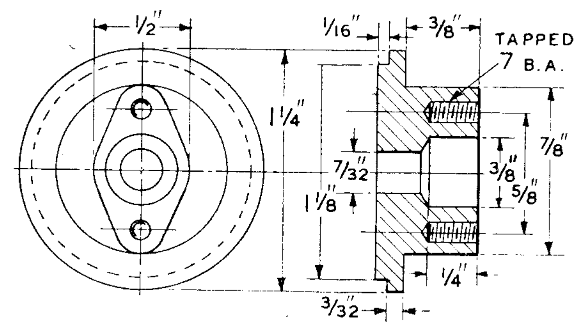
These also are quite straightforward, and simple enough to machine by the methods described in previous articles. Having seen several engines in which the glands were manifestly out of alignment, however, I would urge that care be taken to ensure that the bores and spigots are exactly concentric; there should be no difficulty about this, but if there is, leave the spigots oversize and mount by the bore on a mandrel for skimming them to correct size. Make certain also that the glands slide freely over the studs, without binding in the holes. The edges of these glands are not suitable for machining in the method suggested for those of the ' ' Unicorn," but should be filed and polished, the glands being temporarily screwed fully home in their housings, so that the surfaces of both parts can be filed up together, to coincide in contour.

Slide Valve

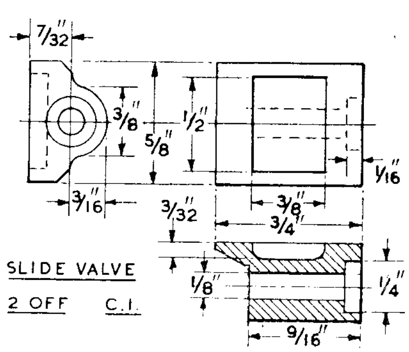
This is somewhat out of the ordinary in its external shape and method of connection to the valve-rod, but its principle of operation, in relation to the port face of the cylinder, is quite normal, the exhaust cavity being equal in length to the distance between the *inner* edges of the cylinder ports, and the external length equal to the distance between the *outer* edges of the same ports, plus the amount of steam lap at each end, which in this case is $\frac{1}{8}$ in. These simple rules apply to most types of ordinary flat slide and piston valves, though in the latter case, it is possible to use inside admission, thus inverting the valve events and calling for suitable modification. I mention this because of the many queries which arise in respect of valve dimensions and timing, most of which could easily be solved by application of the above rules.

This particular slide valve, instead of being slotted across the back as is usual in model steam engines, has a hole drilled through it longitudinally to take the end of the valve-rod, which is screwed, and fitted with two sets of locking nuts so that the positional adjustment of the valve can be carried out. The hole must be larger than the diameter of the rod, and the nuts suitably adjusted to allow the valve to find its own seating, and prevent it being forced out of place by rigid connection to the rod.

(To be continued)



FRONT CYLINDER COVER 2 OFF C.I.



SLIDE VALVE 2 OFF C.I.

SIDELIGHTS ON PRACTICAL LATHE-WORK

By "Scotia"

THERE are many aspects of lathe-work which only become apparent through long experience with turning. The following comments on lathe-work in general are for the most part of a simple character, but nevertheless are perhaps worth reviewing. Indeed, these notes may be regarded as a cross-section of the every-day happenings which arise in the workshop. It is a curious fact that by using incorrectly-shaped cutting tools in the lathe, the quality of the work involved, and indeed perhaps, the safety of it are in jeopardy.

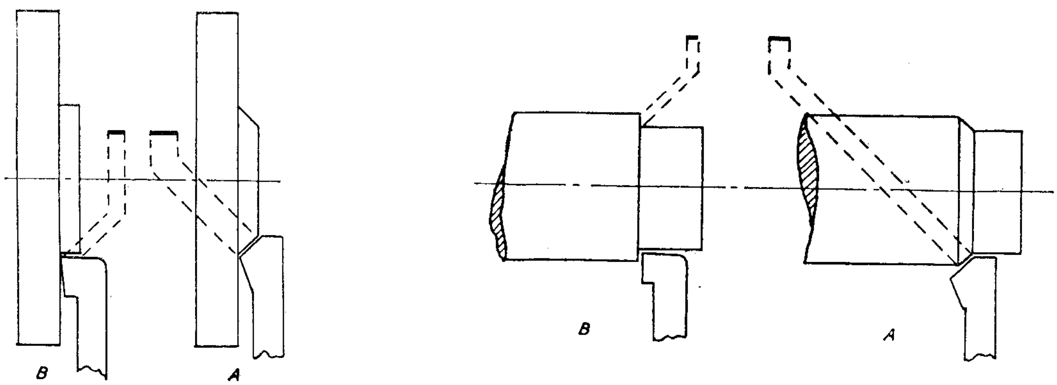


Fig. 1. *Showing how a bevel-edge tool presents a larger cutting area to the work*

First then, let us consider the tools that may be used in the sliding and surfacing of plain work in the lathe. In sketch Fig. 1 it will be seen that two kinds of tools are shown in use doing both of these operations. It will be noted that tool *A* which is shown in use on both the sliding and surfacing operations, is of a diamond shape and may be said to be more suitable for chamfering nuts, etc. However, for the purpose of these notes, tool *A* is shown in use taking the same depth of cut as its more orthodox brother.

Although they have this in common, however, the similarity ends here, and what may not be generally realised is that there is a discrepancy of area in the cutting edges of tool *A* and *B*. In other words, tool *A* is liable to cause chatter or oscillation, due to the fact that a larger area than need be is presented to the work. Especially is this so in traversing work which is unsupported by the back centre.

In order to avoid snags or pit-falls such as could be encountered under conditions like this, it is wise to use the orthodox type of tool shown at *B*. Much the same conditions can arise if a round-nose tool is used, if the cut is of any consequence. Should there be no alternative to using the above type of tools, the material to be removed should be taken off in a series of very light cuts.

The necessity arises on occasion to turn down material to a small diameter for one purpose or another, and unless the length to be turned is very short, it is usually a wise precaution to do so in stages, the first portion being turned down to finished size before proceeding to the next part. Should a cut be taken the entire length of the work with the purpose of reducing the diameter at one fell swoop, it is more than probable that it will either result in the breakage of the material or in the work itself being tapered at its extremity.

Sketch Fig. 2 gives some indication of what is meant. The use of a back centre on work of this kind, while giving useful support to the machining of the material, calls for some discretion in its application, as it is very easy to buckle or twist the material if excessive pressure is applied.

Although it would seem that small diameter rod or bar would be suitable for the purpose, it does not always follow that this is the case, lack of rigidity, due to small diameter, being apparent close in to chuck jaws, the work assuming a wire-like quality in its ability to whip. Contrary to the belief of many who lack experience, best results are often obtained when bar stock is of such diameter that several cuts are required to bring it to size. Sketch Fig. 3 gives an indication, based on practical experience, of hypothetical cuts required on $\frac{1}{2}$ in. diameter stock to produce a mild-steel pin $\frac{1}{8}$ in. diameter $\times$ $1\frac{1}{4}$ in. long.

And now, let us look at a little difficulty which often arises in the setting of work in the 4-jaw chuck. Due to the sides of the component not being at right-angles to the face, or perhaps because the surface in contact with the chuck jaws is of a very rough nature, there is a tendency when closing the chuck jaw, for the line of the casting or the component to follow that of the chuck jaw, thereby defeating any attempt to bring the face of the work into parallel. It is here that tiny strips of packing can be most useful.

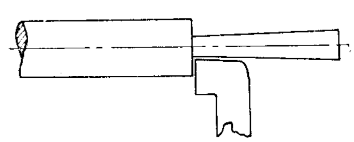


Fig. 2. *Due to heavy cutting strain, material rides away from tool at extremity—resulting in taper shown*

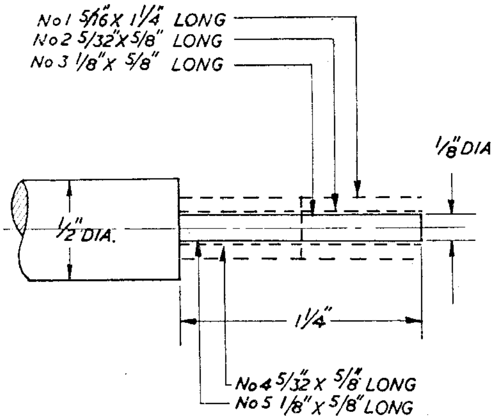


Fig. 3. Fine feeds should be used throughout sequence of cuts

The pieces of packing, which should be of copper, are interposed between the work and the jaws in four positions of the chuck. The use of narrow packing strips such as these facilitates the truing of the face of the work to the finest degree required. A very good alternative to copper strips as packing, is the use of short lengths of soft-iron wire. The latter, although circular in section, will not roll when being gripped, due to the fact that being much softer than either the chuck jaw or the work itself, it assumes a

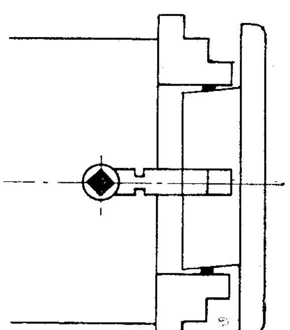


Fig. 4. Correct disposition of packing strips enables casting to be "rocked" into centre

small flat under pressure and will "stay put." For obvious reasons, tempered or hard materials should never be used as packing.

And now, may we finish these notes with some remarks on screw-cutting threads in the lathe? For the various threads which one may be called upon to cut in the lathe, it is most necessary to know the depth of thread required in components of varying numbers of threads per inch in order to ensure accuracy of size, and fit. Oddly enough, this data is not available in every engineer's reference book, and provided that the thread required is of Whitworth standard form (i.e. 55 deg.), the necessary information may be found by the formula: No. of threads per in. divided into 640, equals radial depth of thread in thousandths of an inch.

Suppose we wish to find the depth of thread for 40 t.p.i.

$$= \frac{640}{1} \div \frac{40}{1} = \frac{16}{1}$$

The answer here is 16 thousandths deep.

The ability to find the various thread depths is particularly useful, when one is required to make a part to suit a male thread, thus involving internal screwing.

Assuming that such a job has to be done, the first essential is to find the core diameter. The outside diameter of the part is measured and found to be $1\frac{1}{16}$ in., the number of threads per inch 56.

To find core diameter of part to be screwed:

$$= 640 \div 56 = 11\ 3/7$$

thousandths depth of thread.

For our purpose, $11\frac{1}{2}$ thou. is near enough an approximation of thread depth. Now convert $1\frac{1}{16}$ in. to decimals, which gives us 1.0625. This figure, less twice the depth of thread, namely 23 thou., gives us the figure of 1.0395, which is the core diameter of the part to be screwed.

The figure 640 is constant in determining thread depths, and applicable to all Nos. of t.p.i. When grinding tools for screw-cutting fine threads such as these, a check should be kept on thread form by holding against matching-piece of work, or fine-toothed chaser, and viewing with watch-maker's glass.

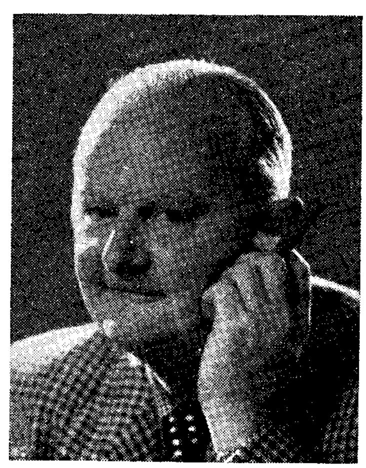
Who's Who IN MODEL ENGINEERING

K. N. HARRIS

The activities with which the name of Mr Harris is chiefly associated are the formation of the Kodak Society of Experimental Engineers and Craftsmen, of which he was chairman until his retirement two years ago, and is now vice-president, and the formation of the S.M.E.E. Affiliation, of which he was chairman for several years.

He was born in Leicester in 1889 and educated at Wyggerton Boys' Grammar School and Leicester Technical School. He has been a reader of *THE MODEL ENGINEER* since its first issue in 1898, and possesses a complete set of "M.E." volumes. His interests include locomotives, marine engines, all forms of steam engines, power and sailing boats, small machine tools, and workshop equipment. In addition to the construction of three locomotives and at least a dozen marine engines, also several horizontal and stationary engines and a variety of boilers, he has built and reconstructed a number of small machine tools and much engineering equipment.

In spite of his many activities in model engineering, he has other favourite hobbies and pursuits, of which athletics and open-air sports have always been well to the fore; cricket and boating may, perhaps, be said to be first in the list.



QUERIES AND REPLIES

"THE M.E." FREE ADVICE SERVICE. Queries from readers on matters connected with model engineering are replied to by post as promptly as possible. If considered of general interest the query and reply may also be published on this page. The following rules must, however, be complied with:

(1) Queries must be of a practical nature on subjects within the scope of this journal.
(2) Only queries which admit of a reasonably brief reply can be dealt with.
(3) Queries should not be sent under the same cover as any other communication.
(4) Queries involving the buying, selling, or valuation of models or equipment, or hypothetical queries such as examination questions, cannot be answered.
(5) A stamped addressed envelope must accompany each query.
(6) Envelopes must be marked "Query" and be addressed to THE MODEL ENGINEER, 19-20, Noel Street, London, W.1.

Drilling Hardened Steel

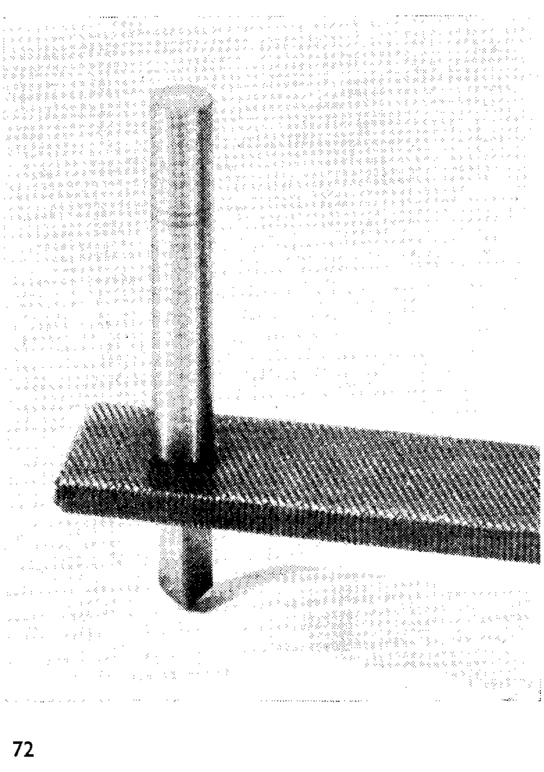
I have obtained from a car-breaker a pair of hardened gears, which I wish to use in their present condition. I must, however, drill three $\frac{5}{16}$ in. holes in one of the gears, but I do not want to soften this, as I doubt my ability to re-harden correctly. I believe that special drills can be obtained for this type of work, and I shall be glad of any particulars you can give me.

W.J. (Littleover).

It is quite possible to drill hardened steel with the carbide-tipped drills now available, or with the *Stellite* drills made specially for this purpose. We have used these latter drills very successfully, and we show, for your information, a photograph of a hardened file through which we have drilled a $\frac{5}{16}$-in. hole.

The drills in question are known as *Stellite Grade* 100, and a special technique is required for their use. Drilling speeds are surprisingly high; a $\frac{1}{8}$-in. drill requiring 3,000 r.p.m., while the $\frac{5}{16}$-in. drill depicted was used at 1,200 r.p.m. A heavy pressure is needed to start and maintain the cut, and the chips come off at a dull red heat. The drill cuts, in fact, because the friction softens the material locally, while leaving the drill intact. This softening is extremely local, and does not extend for more than $\frac{1}{16}$ in. around the hole.

The drills are fast cutting, and the file illustrated was drilled in a few seconds. More remarkable still, the hole is exceptionally close to size, and it is difficult to push the drill into the hole afterwards.



Acid-proof Tank

I have to machine a number of large bronze castings. As these seem to be well impregnated with moulding sand, I think it advisable to pickle these castings in an acid bath before attempting to machine them. My puzzle is what to use as a container for the acid, as an ordinary metal bath would obviously be useless. At the same time, I do not wish to incur the expense of a large stoneware bath. Is it possible to construct a bath of wood, with some suitable acid-proof lining?

C.P. (Stroud).

A suitable container for acid can, indeed, be constructed of wood, preferably of planks of 1 in. in thickness. These should be screwed together and battened at the joints.

A formula for an acid-proof coating is as under: 75 parts, by weight, of pitch, 9 parts plaster of paris, 9 parts ochre, 15 parts beeswax, and 3 parts litharge. The tank should be covered on the inside with a thick coat of this mixture.

It is, of course, possible to proof an ordinary galvanised iron washing bath in this manner, but care would have to be taken not to let the acid splash on to the unprotected outside surface.

Distinguishing High-speed Steel

I am a beginner, and have just bought my first lathe, second-hand. With the lathe was a collection of turning tools, which I was assured were of high-speed steel. Even to my unpractised eye, however, these tools differ not only in appearance but in actual use, and I suspect that some of them are not of high-speed steel. How, may I be sure of this?

P.N. Junr. (Colne, Lancs).

The simplest test is that provided by the grinding wheel, as the difference between high-speed steel and high carbon tool-steel may be determined by the appearance of the spark. The sparks from high-speed steel are of a dark red colour, thin, and not very profuse. Carbon-steel, on the other hand, will emit a large number of fat, brilliant sparks, and the difference is easily noticeable.

Lapping Trouble

I am constructing a small compression-ignition engine, and am experiencing trouble with the lapping of the cylinder bore. I am using a lead lap of a recommended type, with metal polish as an abrasive. I have already spoilt one bore by reason of the lead lap scoring, and building-up, thus scoring the bore beyond salvation. Is the trouble due to the lap, the abrasive, or to some other cause unknown to me?

F.M. (Whitby).

Your trouble is probably due to the lap itself. Lead, although often recommended for lapping work, is, in our experience, liable to the trouble you mention, which frequently occurs when the lap is allowed to become dry. This causes high local friction, and the surface of the lap breaks down. Copper laps do not seem to be prone to this trouble, and are to be preferred. Metal polish, especially if lightly diluted with lubricating oil, is quite suitable for lapping steel or cast-iron cylinders.

(*Continued on page* 75)

An improved Filing Rest

By K. N. Harris

IN the February 14th, 1952 issue of THE MODEL ENGINEER there appeared a description of a filing rest, the joint production of Messrs. White & Sparey.

Filing rests are most valuable accessories for the amateur mechanic, and for that matter for the jobbing professional as well. A great variety of work can be expeditiously and accurately carried out with their aid, frequently much more quickly than by milling, even if milling gear is available. I am, of course, referring to odd "one" or "two" off jobs, not to production work.

I was the more interested in this design, as I was just getting round to making a filing rest for my 90-mm. cr. Boley lathe, a job I ought to have done long ago; Mr. White's article gave me the necessary stimulous and the rest herewith described and illustrated is the result.

As a general rule, filing rests are made only in the smaller sizes and used on watch and clockmakers' lathes or instrument lathes. I already have a couple of this class which I made many years ago, and which have been in constant use ever since. There is, of course, no reason whatever why they should not be used on larger lathes for heavier work, and in fact, they are just as useful on a 5 in. centre lathe as on a $1\frac{1}{2}$ in.

Whilst the White-Sparey rest is an excellent article, there are one or two points about it which I do not altogether like. These are (1) The somewhat excessive overhang from the horizontal pivot to the roller (this is important in my case, as I am liable to be using files up to 12 in. with the rest). (2) The height adjusting collar having its indexed edge working over the *threaded* portion of the main column. (3) Having to adjust two screws to tilt the roller frame, and (4) the fixed heads of the roller spindles being used for the edge guide to the file.

This sounds a formidable list of objections, but in actual fact none of them is of serious import except No. 4. That in my opinion is definitely a fault; it is neither good for the file, nor good for the spindle heads, which will inevitably quickly show signs of wear in use.

The accompanying drawings show the result of my no doubt misguided efforts, and I must leave it to readers to judge whether I have actually improved this gadget or not.

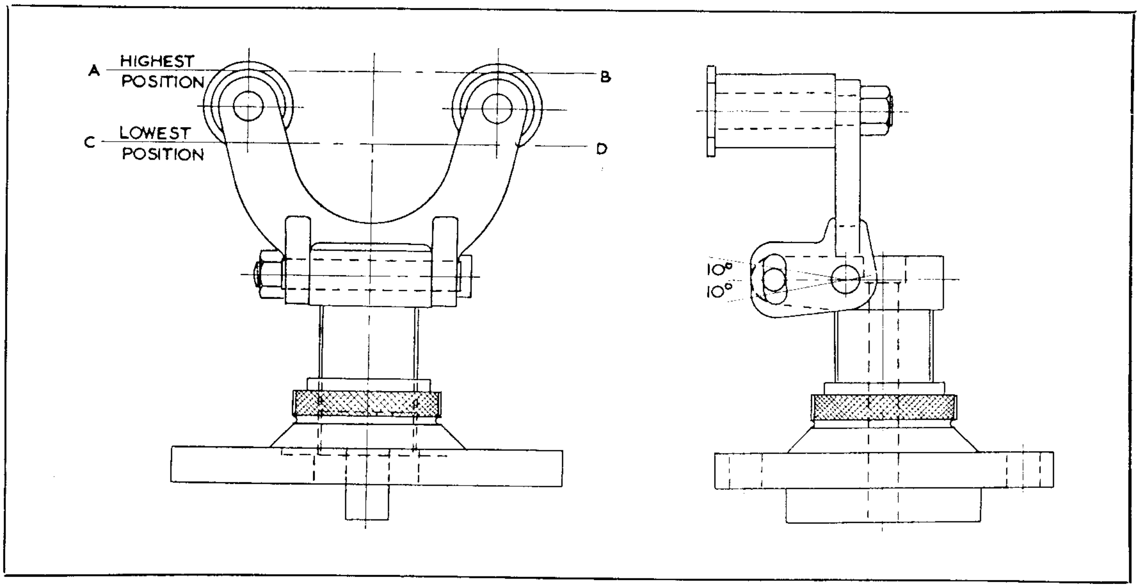
The unit was designed to accommodate work up to $1\frac{1}{2}$ in. diameter "across corners," which requires a range of height adjustment of $\frac{3}{4}$ in.

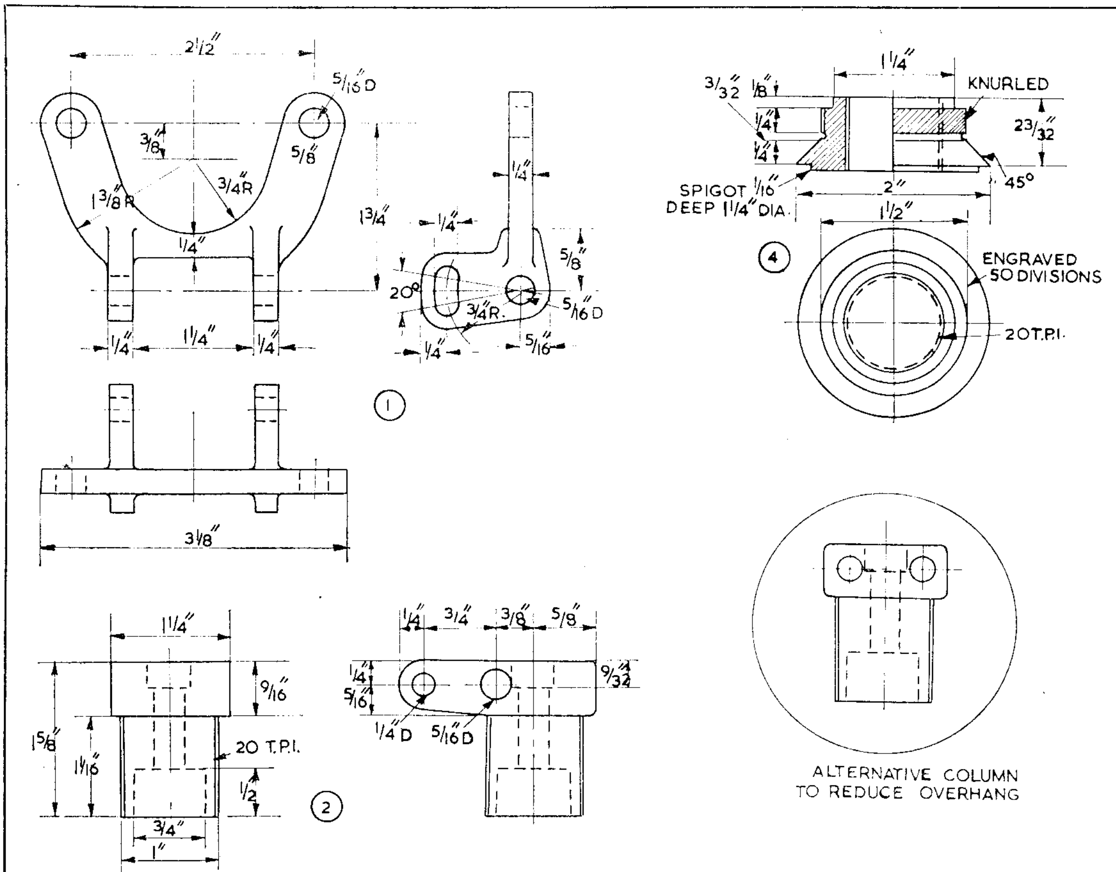
As the Boley is not fitted with a boring table, I made the unit complete with its own baseplate and two "tee" bolts to fit in the centre slot of the lathe bed. By means of an adaptor-plate, the rest can also be used on my $4\frac{3}{4}$ in. Adams-Pittler lathe.

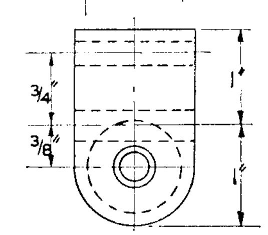
The height-adjusting collar and the column are threaded 20 t.p.i., and the rim of the collar carries 50 divisions, which incidentally were indexed on the dividing engine recently described (see THE MODEL ENGINEER, 18/12/52). Thus one division equals a rise or fall of 1/1,000 in.

It will be noted that it is the bevelled rim of the adjusting collar which is indexed and this works over a zero mark on the baseplate.

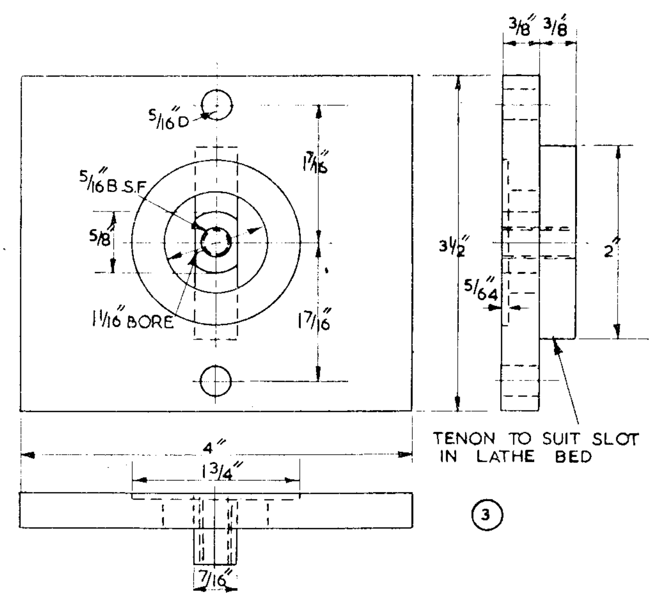
The rollers were made as shown, with their own flanges (to act as an edge guide to the file) and the heads of the pivot bolts were recessed into them; grease holes and plugs are included in these pivot bolts, and it is as well from time to time to remove the axles and to clean them and the rollers thoroughly, particularly after operating on cast-iron.

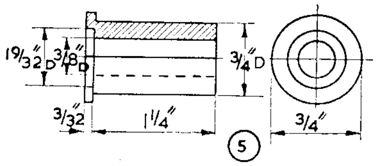


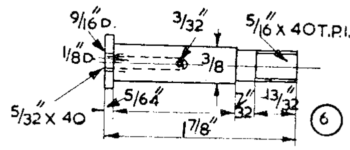


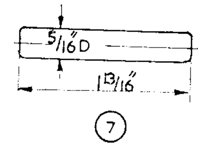


SCHEDULE OF PARTS			
NO	OFF	DESCRIPTION	MAT.
1	1	ROLLER BRACKET	MS
2	1	COLUMN	MS
3	1	BASEPLATE	MS
4	1	ADJUSTING COLLAR	MS
5	2	ROLLER	CS
6	2	ROLLER SPINDLE	MS
7	1	SPINDLE FOR 1	MS
8	1	LOCKING BOLT FOR 1	MS
9	1	CAP HEAD SCREW 5/16" B.S.F.	CS
10	2	5/16 X 40 NUT FOR 6	MS
11	1	1/4 X 40 NUT FOR 8	MS







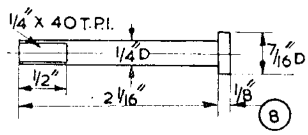


The rollers are made of cast-steel, hardened right out in oil and *not* tempered. The pivot bolts are made of good mild-steel, thoroughly case-hardened.

A most excellent feature of the White-Sparey design is the fitting of the roller carrying frame at the *outboard* end, it is the first time I have seen this done, and particularly in the smaller sizes the advantages are so obvious that one wonders why nobody apparently ever thought of it before.

The swivel-pin hole for the roller-carrying frame is off-set from the centre-line of the main column to clear the locking-screw, which is a standard socket-headed cap screw.

To secure additional rigidity without the necessity of excessive tightening of the roller carrying frame locking-bolt, this is made a separate unit from the pivot pin, and arms are extended from the latter, with radial slotted holes in them to allow of the rollers being tilted up to 10 deg. either way. It will be noted that these modifications have greatly reduced the overhang of the rollers as compared with the White-Sparey design, a point of some importance in my own case, as the whole unit is much larger and is likely to be used for comparatively heavy work.



I had been contemplating something considerably more complicated than the White-Sparey design, along the lines of the one described in the last issue of The Model Engineer for 1939 and the first for 1940, but the White-Sparey is much simpler and much more versatile. My thanks are due to both gentlemen.

For use with the rest, I have made a plain dividing apparatus which fits into the tail-end of the lathe mandrel (The Adams-Pittler lathe already has the main back-gear wheel divided into two rows of holes, 120 and 100, which cover all normal requirements.) In addition, the faceplate is divided on the edge into 180 and all the chucks, two four-jaw independent and three three-jaw S.C. have a row of 12 division holes around the bodies. giving 2-3-4-6 or 12 positions for work.

This filing rest is just another of those accessories, simple to make and taking comparatively little time and material, which will repay the labour spent on them many times over. It greatly simplifies the accurate production of squares and hexagons on water and steam fittings, and is very useful for making "D" bits, special taper broaches for injector or ejector cones, broaches for square or hexagon holes, and a lot of other odd jobs which otherwise entail either a milling set-up, or a quite considerable degree of manual skill.

The more simple mechanical aids to his work the average amateur can get, the faster he can work, and the higher the quality of the work he turns out is likely to be; not every amateur has a milling machine, and the filing rest, whilst, of course, not being a substitute, goes quite a long way to fill the gap.

Note: It would I think be an improvement to alter the column as indicated in inset drawing, as this would have the effect of reducing the bending moment on the column when using a heavy file.

QUERIES AND REPLIES

(*Continued from page* 72)

Adjustment of Top-slide

When a tool is clamped up tight in the toolpost of my new lathe, I find that the adjustment of the top-slide becomes excessively tight, so that it is most difficult to operate smoothly. The toolpost in question is of that type in which a flat plate is secured by a central bolt, with a packing adjustment under one side of the plate. The tightening is undoubtedly due to distortion of the top-slide under pressure of the clamping bolt, and is, so far as I can see, bound to happen with this toolpost arrangement. Is there, in fact, any means by which this trouble may be overcome?

A.A.T. (Newport, Mon).

The tightening of the top-slide adjustment due to tool clamping is a very common occurrence, and may happen with most types of toolpost even on large and heavy machines. The toolpost you mention is especially prone to this trouble, and we suggest that you might try another type, in which the tool is held in the toolpost itself, and does not depend upon actual clamping pressure on the top-slide. Possibly a four-way toolpost may relieve the trouble to some extent, and provide facilities in other directions as well.

Although not theoretically correct, we have found that an almost perfect cure may be obtained by adjusting the gib of the top-slide while a tool is clamped up tight in the toolpost. It is, after all, only under these conditions that the top-slide is used.

Preparing Steel for Marking-out

I recently saw some steel plates which had been marked out ready for machining, and I was struck by the fact that the surfaces had been prepared with some dark blue substance through which the scribed lines showed very clearly. Can you tell me what this substance was likely to be, as it seemed a great improvement over the copper sulphate solution which I have been using?

T.D. (Ponders End).

The prepared surface to which you refer was probably obtained with *tin-printing ink*, which is now often used on account of the clarity of scribed lines on bright steel. This ink may be had in various colours from Messrs. Caribonum Ltd. of Leyton, London, E.10. Other preparations, consisting usually of aniline dyes dissolved in alcohol, with a little shellac as a binder, are sold for this purpose, but are not so permanent.

The ink should be applied to the work with a soft rag, and allowed to dry off. The surface is durable, and will withstand heat or moisture.

IN THE WORKSHOP

BY DUPLEX

FINISH-GRINDING TUNGSTEN-CARBIDE TOOLS

THE rough grinding of carbide tools, including the equipment required and the methods used, was described in the previous article. There it was shown that the angles ground at the tip of the tool are best made 1 deg. or so greater than those formed during finish-grinding. The purpose of this is to leave only a very small amount of material to be removed in order to sharpen the cutting edges, for the carbide tip is extremely hard and can only be ground comparatively slowly by the fine-grit wheel used for the final grinding. The coarse wheel employed for rough grinding leaves the tool's cutting edges somewhat irregular, owing to the crumbling that takes place, but for the final sharpening, the edges can be smoothed on the finishing wheel, by setting the grinding rest to a slightly smaller angle, and then grinding lands of 1/32 in. or less in width on the surfaces of the tool tip.

On future occasions, the tool can be resharpened by grinding these lands still further, so that rough-grinding may not become necessary until the tool has been resharpened several times in this way. When, for example, grinding a small flat on the point of a knife tool, cutting is rapid and the small facet can be formed in a few seconds, but where a long, straight edge on the tool is applied to a flat-faced wheel, grinding will be very much slower, and there is the danger of overheating and cracking the carbide material. It is for these reasons that some workers prefer to use a wheel with a slightly curved working face, formed with either a diamond tool or with the ordinary star-wheel dressing tool.

The Grinding Wheel

A 3 in. diameter cup wheel is fitted, as this type is easily mounted on the spindle, and the single, narrow grinding face can be maintained in good working condition with but little attention. As before, a green-grit silicon carbide wheel must be used, and, in order to ensure that fresh, sharp abrasive grains are continually exposed, the wheel should

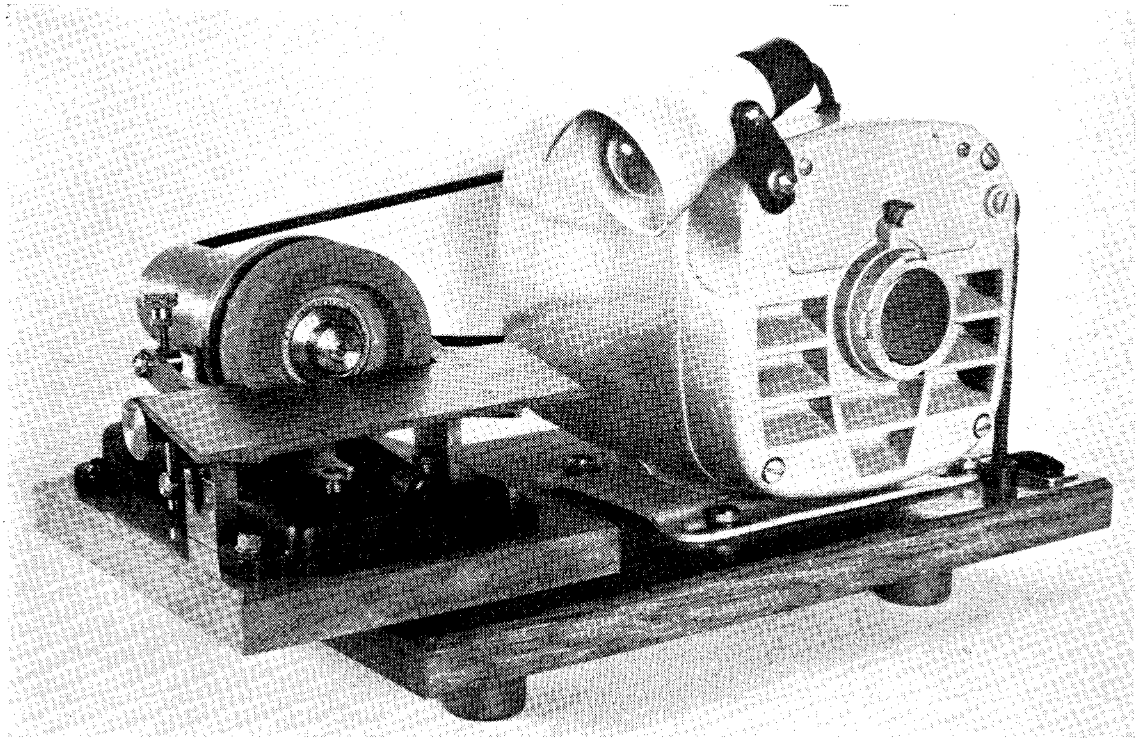


Fig. 1. *The finished grinding machine*

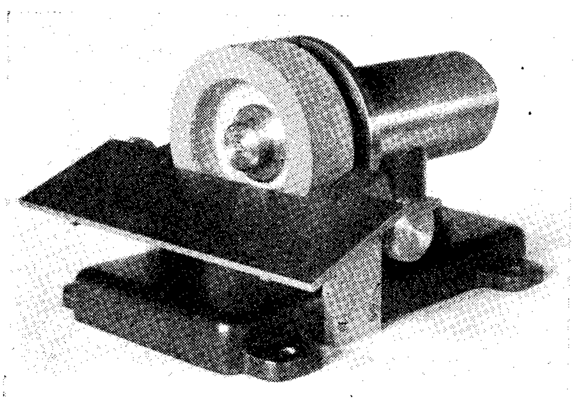


Fig. 2. The grinding head and baseplate

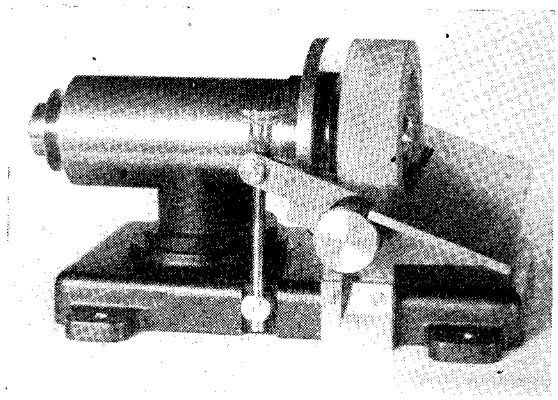
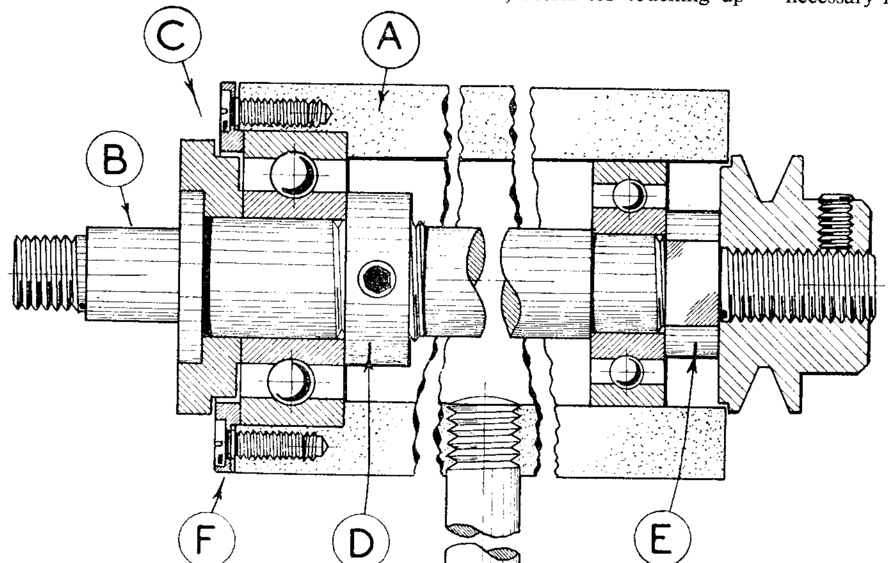


Fig. 3. Showing the method of mounting the head and the arrangement of the tool rest

be of the soft grades, I or J, recommended by the manufacturers.

A grain size of 100 is sometimes advised for off-hand grinding carbide tools, but in practice we find that a 220 grit wheel, obtained from the Universal Grinding Wheel Co., leaves a very smooth edge on the tool, although grinding is then rather slower. As so little of the hard carbide is removed, there is little danger of the surface of the wheel becoming loaded with the tip material, but on the other hand, the abrasive grains become quickly blunted, and it is important, therefore, that they should be readily shed by using a wheel of soft grade; that is to say, the bonding material of the wheel holds the abrasive grains with but moderate tenacity. Green-grit hones are also obtainable, and we have found the No. 37, fine-grit stone, made by the Carborundum Co., useful for touching up the edges of carbide tools by hand.



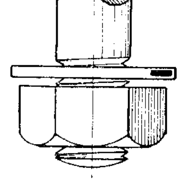


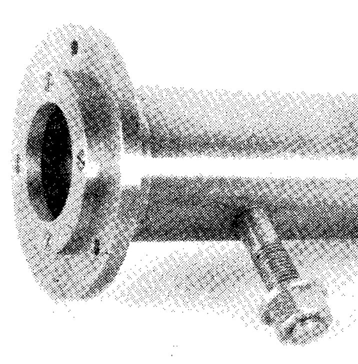
Fig. 4. The grinding head shown in part-section. A—the body; B—the spindle; C—the inner wheel flange; D—the left-hand clamp collar; E—the right-hand clamp collar; F—the bearing clamp ring

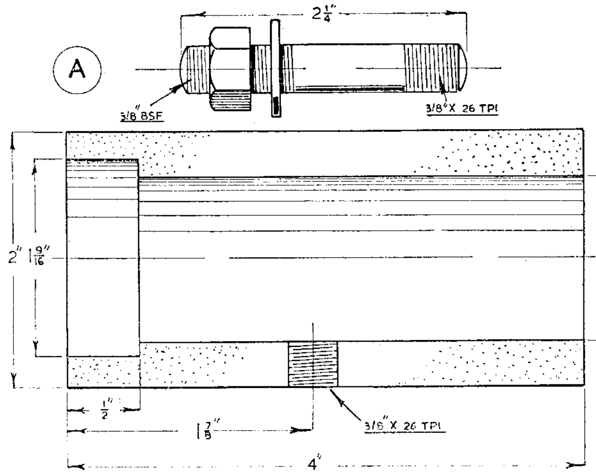
A Machine for Finish-grinding

As fine grinding is all that is usually necessary in the small workshop for keeping the carbide tools in order, a grinding head has been built specially for this purpose. Moreover, as this machine will be only occasionally required, it was decided to make use of the electric motor drive and baseboard built for the twist drill grinding jig, described in previous articles.

The finished machine is illustrated in Fig. 1, and both the tool grinder and the twist drill grinder can be readily detached and replaced by undoing a single nut.

Below: Fig. 5. The finished body





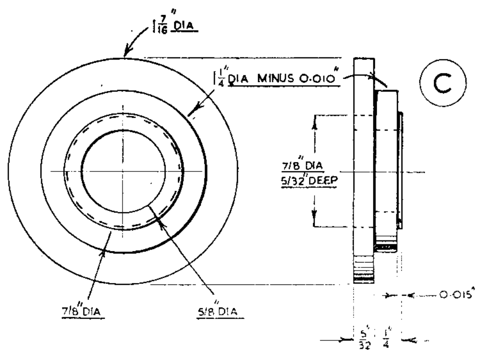


Fig. 9. *The inner wheel flange*

Left: *Fig.* 6. *The grinder body and fixing stud*

One could, of course, go further and use the same grinding head for both tool and drill grinding, but this would involve much waste of time in making the rather difficult change-over, as well as greatly complicating the design.

The Body A

This was made from a piece of bronze forming part of some war surplus equipment that happened to be available, but in the past we have used for this purpose a length of the tubular bronze material obtainable commercially for making bearing bushes. The flange, seen in the photographs, on the end of the barrel, was left in place, as it might come in useful for attaching a guard. The single stud, screwed into the body, serves for attaching the grinding head to its base, but where bushing material is used for making the body, the stud hole will serve for attaching the work to an angle-plate, so that the two bearing housings can be machined in correct alignment at the same setting. The left-hand ball-bearing, Fig. 4, is made a light push-fit in its housing, and the other bearing should be a close sliding-fit.

The Spindle B

This part was turned between centres from mild-steel rod, and all the threads shown were screwcut with a single-point chasing tool, in order to obtain the correct thread form without having to use a die. The ball-bearings fitted are: on the left, a Hoffmann deep-groove bearing No. LS7, and on the right, a similar type of bearing, No. LS5; both are a light push-fit on the spindle. The flange *C* forms the inner flange mounting for the grinding wheel, and is made a light press-fit on the spindle. After the spindle has been machined, the flange and the bearing are mounted on the spindle, and the collar *D* is firmly tightened to secure these parts in place. The assembly can now be mounted again between centres for taking a light cut over the face of the flange to make sure that it runs true; however, the chips must be kept out of the bearing by a wrapping of rag held in place with an elastic band. As will be seen, the ring *F* serves to clamp the outer race of the left-hand bearing and keep it from turning in its housing, and the inner race has already been secured to the spindle. In this way, the bearing is correctly mounted in accordance with the manufacturer's instructions.

Care must be taken to ensure that a small clearance is given between the flange *C* and the ring *F*, and also between *C* and the outer bearing race. The inner race of the right-hand bearing is securely clamped to

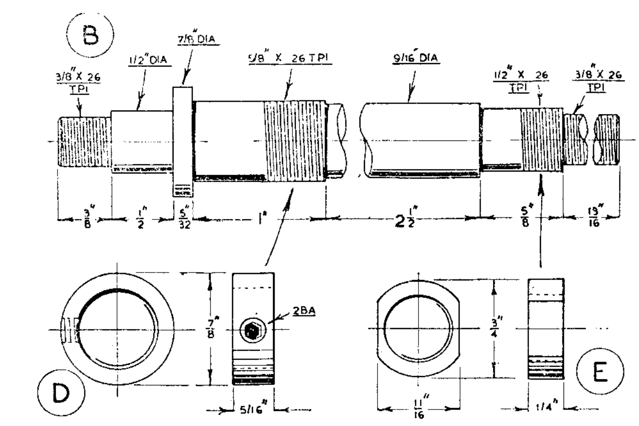


Fig. 8. *The spindle and the two bearing clamp collars*

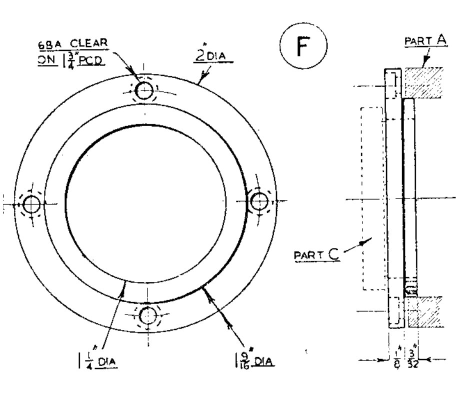


Fig. 10. *The clamp ring for the left-hand bearing*

the spindle by the locking ring *E*, which is provided with spanner flats for tightening. The locking ring itself is afterwards secured by tightening the small driving pulley, and the latter is finally locked to the spindle with an Allen grub-screw. The purpose of this somewhat elaborate locking system is to ensure that the parts do not unscrew when the direction of rotation of the wheel is reversed for grinding tools on their upper surfaces. To allow the right-hand bearing to line itself up and prevent nipping of the balls, the outer race can slide in its housing both during assembly and where changes of temperature cause unequal expansion of the spindle and grinder body.

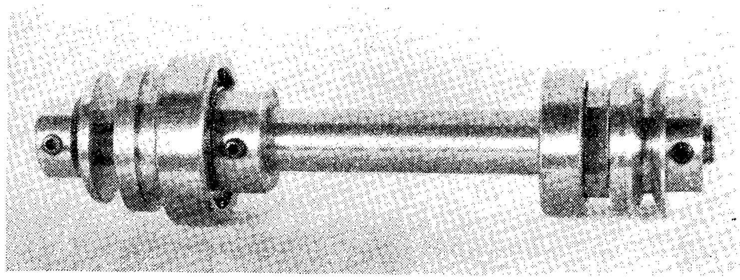


Fig. 7. The complete spindle assembly

The Pulley

A stub of $1\frac{3}{8}$ in. diameter cast-iron or mild-steel is used for making this part. If the V-groove is turned to an included angle of 45 deg., the $\frac{3}{16}$ in. diameter round leather belt will obtain sufficient driving grip. A length of sewing machine belting has been used, but an endless V-belt of the correct length will serve equally well, provided that it is sufficiently flexible to run on the small pulley and the pulley angle is altered accordingly. As the 3 in. diameter grinding wheel should run at some 6,000 r.p.m. and the pitch diameter of the small pulley is $1\frac{3}{16}$ in., the large driving pulley will have to have a pitch diameter of approximately 5 in. when fitted to a motor running at 1,440 r.p.m. If the wheel is run at a slower rate, the worn abrasive grains will be more readily shed and the wheel will have less tendency to become glazed, but grinding will then be slower and wheel wear more rapid.

Assembling the Grinding Head

After the left-hand bearing and the flange *C* have been secured to the spindle, with the ring *F* placed between, the assembly is entered in the body and the outer bearing race is clamped by the ring *F*. A split nut or a brass sleeve is fitted to the left-hand end of the spindle to enable the assembly to be gripped in the vice for fitting the right-hand bearing. This bearing is seated in the body, and pressed against the shoulder of the spindle, by screwing down the clamp collar *E*. The pulley can be tightened on this collar by means of a length of threaded rod inserted in the hole for the Allen grub-screw. If, after assembly, the spindle does not turn freely, it should be lightly tapped at either end with a raw-hide mallet to remove any end-thrust imparted to the bearings by the clamping pressure applied during assembly.

The cup-wheel should slide freely on to the end of the spindle; but if it fits too tightly, the bore of the lead bushing should be eased by careful scraping with a sharp knife.

The wheel is retained in place by the circular nut and washer shown in Fig. 12. The washer forms the outer flange of the wheel mounting and is bored to slide on to the $\frac{1}{2}$ in. diameter spindle. The nut is fitted with an Allen grub-screw to serve as a lock. To secure the wheel, a threaded rod is screwed into the grub-screw hole in the pulley and the wheel nut is tightened by means of a key inserted in the Allen locking-screw.

The wheel nut should only be tightened sufficiently to ensure an adequate frictional drive for the wheel.

(To be continued)

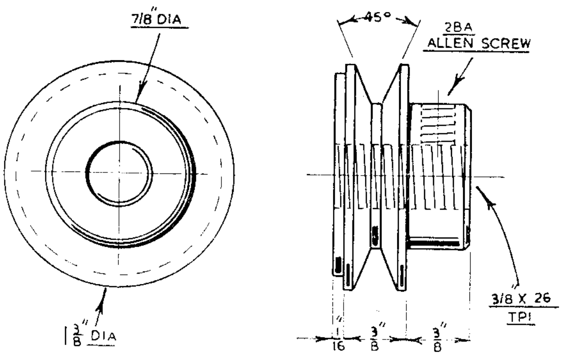
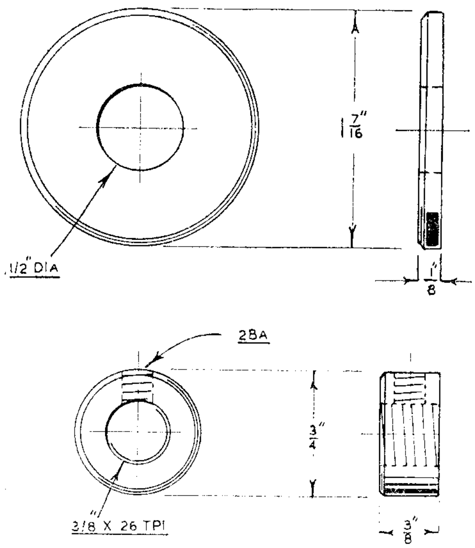


Fig. 11. The spindle driving pulley



Right: Fig. 12. The outer wheel flange and wheel-nut

READERS' LETTERS

● Letters of general interest on all subjects relating to model engineering are welcomed. A nom-de-plume may be used if desired, but the name and address of the sender must accompany the letter. The Managing Editor does not accept responsibility for the views expressed by correspondents.

THE "GLASS CASE" MODEL

DEAR SIR,—I am sure it must have given great pleasure to many of your older readers to see the article by Mr. Baines, in a recent issue, about his 1½-in. scale G.N.R. Stirling 8-ft. single locomotive, together with the excellent accompanying illustration.

In the aggregate, I have spent many hours examining and admiring this masterpiece, and it is good to know that its talented builder is still with us. It is certainly one of the high spots in the locomotive collection, and in my opinion is all the better for being unpainted.

Of late, there has been a noticeable tendency to speak slightingly of " glass case " models, as if they were something inferior. To me this attitude is completely inexplicable on any rational grounds. I yield to none in my love for working models, of the type, for instance, to be seen on the S.M.E.E. track at the " M.E." Exhibitions; but I would point out that, long after the vast majority of purely working models have been consigned to the scrap heap, and along with their builders, utterly forgotten, such masterpieces, as Mr. Baines' model will be giving pleasure and instruction to generations as yet unborn. To such artist-craftsmen as the late Bros. Coates, Dr. Bradbury-Winter, A. W. Marchant, along with people like Mr. Baines, Commander Barker and Mr. Tucker, to name but a few, posterity will owe an incalculable debt for the preservation in tangible form of records of engineering products ,the originals of which have long since disappeared. The art of such people is the highest development of model engineering, and it is sincerely to be hoped that none whose inclinations and abilities lead them in this direction, will be discouraged by unthinking deprecation of " glass case " models.

Yours faithfully,
Rustington. K. N. HARRIS.

STEEL SECTIONS

DEAR SIR,—I was interested to see a reference to the varying quality of " bedstead " angles in an article on somebody's workshop. As a steel merchant (distinct from stockholding merchant), I have had a great deal to do with this class of material. The sections are mostly rolled in the Black Country from " Shell Discard steel," or much more frequently, railway lines. The latter are normally rolled in high grade carbon and manganese steels, but these two elements vary a great deal. Analysis has shown the carbon content to drop as low as .35 per cent. but normally it runs about .50/.60 per cent. I understand that it is liable to be as high as 1.5 per cent., but have never come across this myself. Rails are being successfully rolled into round, square and flat section bars, and are, of course, commonly used for colliery arches, after being rolled into a special joist section.

Yours faithfully,
Churchill. STEPHEN G. HAYNES.

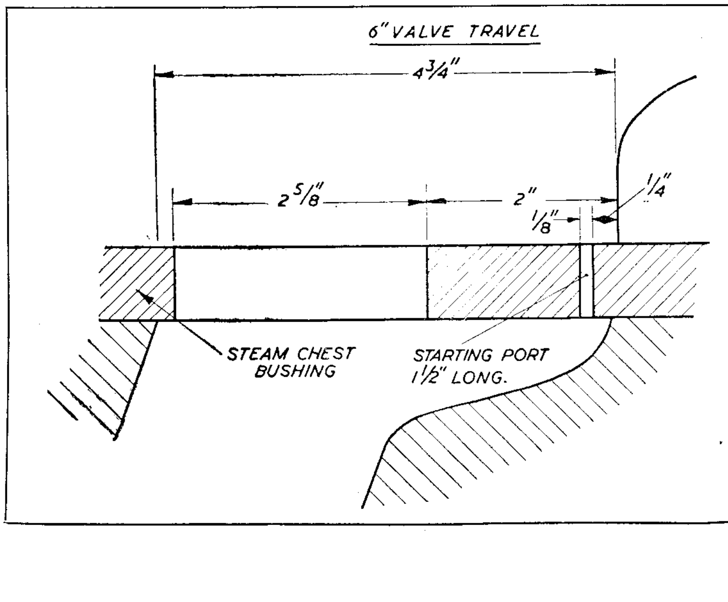
50 PER CENT. CUT OFF

DEAR SIR,—I have read the interesting articles on the ⅞-in. scale Dean G.W. engine by Mr. D. G. Webster in THE MODEL ENGINEER, also that he asks how the 50 per cent. cut-off for locomotives is arranged.

The design was first used by the Pennsylvania R.R. in 1915 on their " I " class 2-10-0 engines, and consists of an auxiliary starting port ⅛ in. × 1½ in. which would admit enough steam to overcome the possibility of non-starting, yet being such a small opening does not materially affect steam consumption. It had the disadvantage of being easily choked up, hence somewhat of a nuisance to keep clear. The P.R.R. built a number of engines but the device did not gain general acceptance. The sketch and dimensions reproduced are taken from *Locomotive Encyclopaedia*, and note from *Steam Locomotive in America*, by A. W. Bruce.

The steam locomotive is rapidly vanishing here in the States. When I first came over in 1920 there were 64,825 total, of which 366 were electric, the latest figures for 1952 are total 37,706, of which 16,450 are steam 786 electric, and 20,480 diesel electric. The average tractive effort, for all locomotives was 52,577 lb. in 1946 and 59,350 for 1952. At the present rate of dieselisation there will be no steam locomotives in U.S.A. by 1965. Apparently there is no fear of petroleum wells running dry. It seems a pity to have the steam locomotive vanish, there cannot be the romance in diesels, which are all practically identical except for the paint.

Yours faithfully,
Baltimore. H. J. COVENTRY.



THRUPPLE NUTS

DEAR SIR,—With reference to the papers found after Mr. Michael Oxley's accident mentioned in your issue of December 10th, we thought the following note would be of interest—and enclose a carbon copy which you may care to send on to him in hospital.

We doubt whether it is worth all the trouble that he took to make Thrupple Nuts " one off." We have been manufacturing nuts of this type, on a considerable scale, for many years, and in good weeks turn out as many as six or seven.

We would be glad to post him a nut something like his drawing if he cares to remit 4d. in stamps to cover cost and postage.

The price quoted is for the left-hand type. If he wants the right-hand type, this is rather a different matter, as these are manufactured by the " pull through " process (similar to reversing socks) which is more expensive. This type comes out at £5 14s. 7d. each, postage and purchase tax extra.

It does just occur to us that he might be able to manage with one of our " two way " types of which we would be glad to send him one free of charge. There is not much call for this type and we produce thousands as a by-product when making the right-hand Thrupple Nuts.

No doubt we shall hear from Mr. Oxley when he has made what will, we hope, be a very speedy recovery.

Yours faithfully,
p.p. MARTIN RUBECK LTD.
Redhill. M. RUBECK.

P.S.—Is Mr. Oxley likely to be interested in galvanised Guffle Irons?

ROTARY BLOWERS

DEAR SIR,—With regard to W.M.R.'s enquiry, I have a blower of the type he mentions, and have found it quite satisfactory for use with a coal gas blow torch.

I have a ¼ h.p. capacitor type motor (1,425 r.p.m.) mounted with the compressor on a deal baseboard, the former with a 2-in. pulley and the latter with a 4½ in. pulley, giving a speed of approx. 625 r.p.m.

I intended using stepped pulleys, but as I found the above combination gave the results I needed, have not troubled further.

Incidentally, the compressor does not " build up " pressure in the true sense, and in my case the volume of air delivered is controlled by a simple tap on the torch.

Yours faithfully,
London, S.E. H. GOODACRE.

FOWLERS IN TASMANIA

By J. S. Locke

THE photograph shows a Fowler " 22," which is No. 16719, and has previously appeared in THE MODEL ENGINEER (481, Vol. 98, No. 2450), I am a maintenance engineer who immigrated from the Old Country two years ago with the firm who own this engine; indeed, not only *this* engine, but a total of *seven* Fowlers (i.e. three pairs and an odd one), all of which are probably in the finest state of preservation of any steamers now in existence. They have been converted to oil-firing, and the whole story of their activities in large-scale dredging operations here, is rather interesting. They are used to operate a 20 cu. yd. dredger, which itself weighs 5½ tons and is a most ingenious contraption.

I agree that the above is hardly model engineering, but so much interest is evinced by your readers in this subject (I can imagine W. J. H. going green with envy) that it occurred to me that you might consider a full write up on the subject for publication, making the technical details of the Fowlers and their modifications of prime importance, and using their present employment as " background." As a draughtsman, I would be pleased to prepare details of any items of outstanding interest to any readers.